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1479/80

CHICAGO CIRCLE BULLETIN

UNIVERSITY OF ILLINOIS AT CHICAGO CIRCLE
GRADUATE STUDY 1979-80

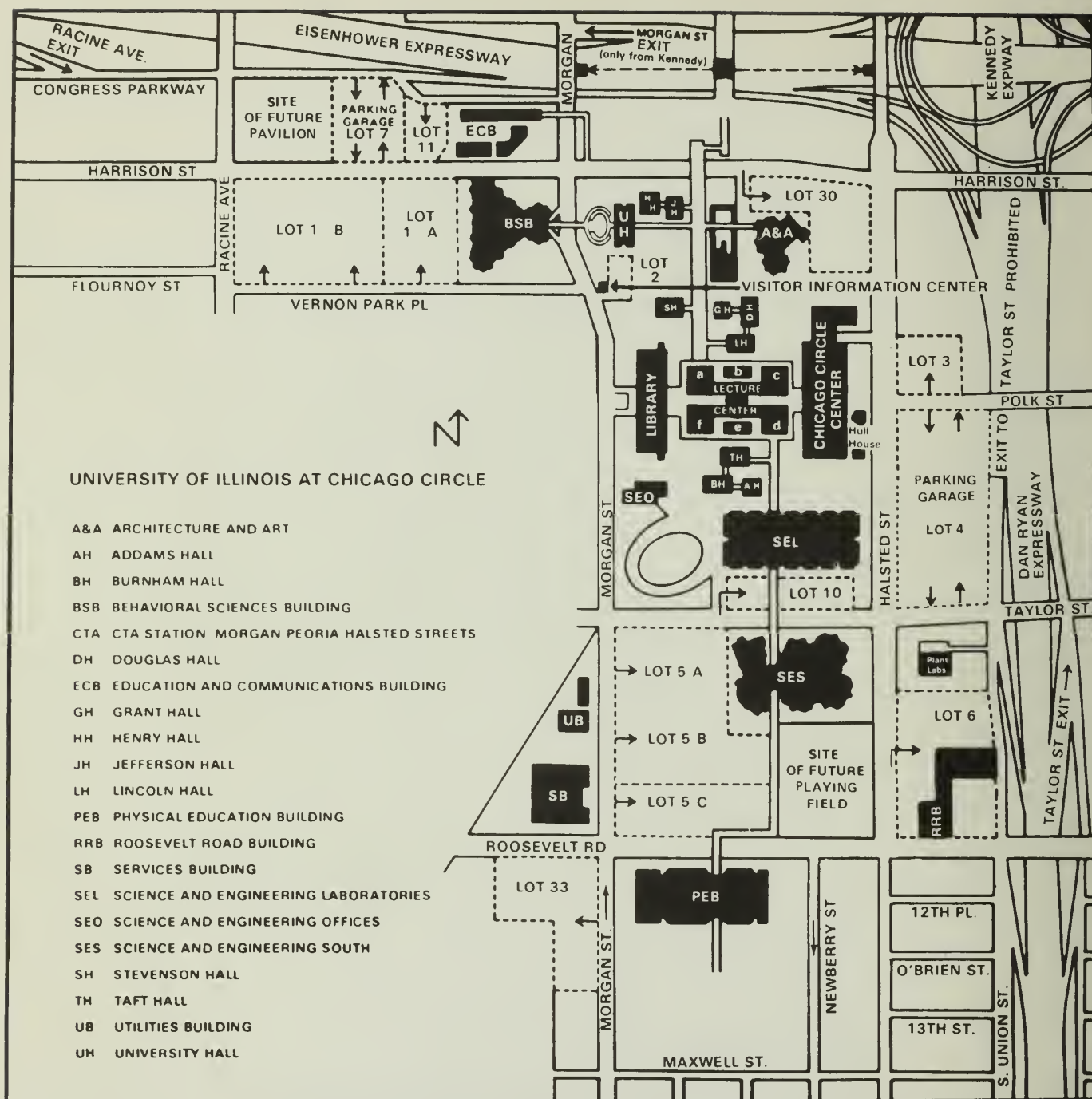


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UNIVERSITY OF ILLINOIS
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CHICAGO CIRCLE BULLETIN

Volume 14

Number 1

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APPLICATION FOR ADMISSION OR READMISSION GRADUATE COLLEGE

**Office of Admissions and Records
University of Illinois at Chicago Circle
Box 4348, Chicago, Illinois 60680**

TELEPHONES:



**Office of Admissions and Records
996-4350**

**Graduate College
996-3320, 3321**

The policy of the University of Illinois is to comply fully with applicable federal and state nondiscrimination and equal opportunity laws, orders, and regulations. The University of Illinois will not discriminate in its programs and activities against any person because of race, color, national origin, ancestry, religion, age, sex, handicap, or status as disabled veteran or veteran of the Vietnam era. This nondiscrimination policy applies to admissions, access to, treatment, and employment in the University programs and activities.

Vice President Ronald W. Brady has been designated as the University equal opportunity officer for the University of Illinois. For additional information on the equal opportunity and affirmative action policies of the University, please consult Richard Johnson, Vice Chancellor for Academic Affairs, or Richard Ward, Vice Chancellor for Administration.

In compliance with the rules and regulations regarding the Guaranteed Student Loan Program, information concerning career patterns of University of Illinois at Chicago Circle graduates is available for individual inspection in the Office of Placement Services during normal business hours.

The full amount of tuition and fees assessed, less a nonrefundable charge, is refunded to students who withdraw within the first 10 days of instruction of a quarter or the first 5 days of instruction of the summer session. After this, no rebate is made for withdrawal or program reduction. Students who cancel their registration prior to the first day of class receive a full rebate of tuition and fees.

APPLICATION INSTRUCTIONS

ALL APPLICANTS:

1. Complete pages 3 and 4 of this application.
2. Sign page 4 of the application.
3. If you intend to take courses after 5 p.m., please note that not all courses are available during these hours.
4. A nonrefundable application fee of \$20 must be submitted with this application. Attach your check or money order, payable to the "University of Illinois," to the top of the application. The University cannot be responsible for cash sent through the mail. (University faculty and staff currently employed may be exempt from this fee.) Only checks or money orders payable to United States banks are acceptable.
5. Detach the application form (page 3 and 4) and mail it with the \$20 fee to the Office of Admissions and Records, University of Illinois at Chicago Circle, Box 4348, Chicago, Illinois 60680.

DEGREE APPLICANTS:

In most cases, graduate units require transcripts from all colleges and universities attended. You do not need to request transcripts for any work completed at UICC. Consult the most recent Chicago Circle Bulletin: Graduate Study (the catalog) or the director of graduate studies for your program regarding specific requirements and supporting credentials necessary for admission to the program to which you are applying. Official transcripts are those that are *sent directly* from the colleges and/or universities attended.

NONDEGREE APPLICANTS:

Nondegree applicants must submit official proof of a bachelor's degree from an accredited college or university to the Office of Admissions and Records. For specific requirements and supporting credentials set by the program in which you plan to take courses, consult the most recent Chicago Circle Bulletin: Graduate Study (the catalog) or the director of graduate studies for the program.

FOREIGN APPLICANTS:

Persons who have completed their studies outside the United States must present all post-secondary school credentials. Such credentials must include all studies completed to date; grades or examination results received (including failing as well as passing grades); maximum and minimum grades obtainable; rank in class; degrees, diplomas, and certificates earned; and length of the school year. Documents must be authentic or certified and those not written in English must be accompanied by certified English translations.

Applicants whose native language is not English are required to submit scores from the Test of English as a Foreign Language (administered by the Educational Testing Service, Princeton, New Jersey 08540).

All foreign applicants who plan to finance their study from personal resources must certify that they will have sufficient funds to cover their expenses. (Obtain the appropriate form from the Office of Admissions and Records or submit a statement indicating the funds available and from what source certified by the United States embassy, appropriate government official, or United States notary if you are in the United States.)

Please note that the University of Illinois at Chicago Circle has no University housing.

GRADUATE PROGRAM CODES

Please list the appropriate code for the program to which you are applying in the program code boxes under question 14.

Administrative Science (Business Administration): MAS-1817BE
Administrative Science (Public Agency Administration): MAS-1817PA
Anthropology: MA-0132
Architecture: MArch-0524
Art, Design and Studio¹: MFA-0824
Bioengineering: MS, PhD-6522
Biological Sciences: MS, DA, PhD-3332
Business: See Administrative Science
Chemistry: MS, DA, PhD-0732
Communication and Theater: MA-6032
Criminalistics: MS-3932
Criminal Justice: MA-3832
Economics, Urban and Quantitative (Department of Economics):
MA-1417UE
Economics, Urban and Quantitative (Department of Quantitative
Methods): MA-1417QE
Education (Instructional Leadership): MEd-5020
Education (Policy and Evaluation Research): MEd-4520
Education (Special Education): MEd-3520
Energy Engineering: MS-6222; PhD-7522EN
Engineering: See Energy Engineering, Information Engineering,
and Materials Engineering
English: MA-1132
French²: MA-5926FR
Geography (Environmental Studies and Urban Geography): MA-1532

Geological Sciences: MS-1632; PhD-7522GE
German: MA, PhD²-1732
History: MA, MAT, PhD-1932
Information Engineering: MS-6622; PhD-7522IN
Linguistics: MA-2332
Materials Engineering: MS-6022; PhD-7522MT
Mathematics: MA, MS, PhD-2432; MST, DA-7832
Nondegree: 5926³
Philosophy: MA, PhD-2732
Physical Education: MEd-2936
Physics: MS, DA, PhD-5432
Political Science: MA, PhD²-3132
Psychology¹: MA, PhD-4032
Public Agency Administration (see Administrative Science)
Public Policy Analysis (Economics): PhD-3126EC
Public Policy Analysis (Education): PhD-3126ED
Public Policy Analysis (Political Science): PhD-3126PS
Public Policy Analysis (Urban Planning and Policy): PhD-3126UP
Slavic Languages and Literatures: MA-3532
Social Work¹: MSW, DSW-4726
Sociology: MA, PhD-4332
Spanish (Hispanic Studies): MA-3432
Speech: See Communication and Theater
Systems Engineering: MS-7022
Theater: See Communication and Theater
Urban Planning and Policy: MUPP-2276

¹ Degree-seeking applicants may apply fall quarter only.

² Intercampus program.

³ Only those nondegree applicants who are requesting courses in two or more departments should enter this code in the program code boxes under question 14.

University of Illinois at Chicago Circle

Graduate College

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TYPE OR PRINT LEGIBLY IN INK. Place an "X" in all appropriate boxes.

1.

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Social Security Number _____
Proposed term of enrollment (check one only)

Fall	Winter	Spring	Summer
Sept.	Jan.	Mar.	June

When do you plan to take most of your classes?
☐ D-8 a.m.-5 p.m.
☐ E-After 5 p.m.
☐ Full Time
☐ Part Time

2. NAME: Last First Middle or previously used

3. Permanent Legal Home Address: Number and Street or Rural Route Apt. No.

City or Town	County	State (or Country)	Zip Code
--------------	--------	--------------------	----------

4. Mailing Address: (if different from permanent address) Number and Street or Rural Route Apt. No.

City or Town	County	State (or Country)	Zip Code
--------------	--------	--------------------	----------

5. TELEPHONE NUMBERS HOME Area Code Number BUSINESS Area Code Number

6. SEX ☐ M-Male ☐ F-Female
7. PHYSICAL HANDICAP ☐ Y-Yes ☐ N-No
8. DATE OF BIRTH

Month	Day	Year			

9. VETERAN OR ACTIVE DUTY IN USA ☐ Y-Yes ☐ N-No

10. This information is requested so that this institution may demonstrate its compliance with federal requirements. Check the box that applies to you.
☐ 1 American Indian or Alaskan native: A person having origins in any of the original peoples of North America and maintaining cultural identification through tribal affiliation or community recognition.
☐ 2 Black, not of Hispanic origin: A person having origins in any of the Black racial groups of Africa.
☐ 3 Asian or Pacific Islander: A person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian sub-continent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, and Samoa.
☐ 4 Hispanic: A person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
☐ 6 White, not of Hispanic origin: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

11. ENROLLMENT CATEGORY
☐ B Beginning Graduate (Attempted fewer than 45 quarter or 30 semester hours of graduate level study; never attended UICC as a graduate student)
☐ T Transfer Student (Attempted 45 or more quarter or 30 or more semester hours of graduate level study, or master's degree; never attended UICC as a graduate student)
☐ R Readmission (Attended UICC as a graduate)
12. ESTIMATED CLASS
☐ 7 If you will have completed less than 45 qtr. hrs. and no master's degree before enrolling at UICC or are applying to a program that does not offer a doctorate, check here.
☐ 8 If you will have completed 45 qtr. hrs. and/or a master's degree and are applying to a program offering a doctorate, check here.
☐ 9 Nondegree applicants check here.

13. Do you wish to be a candidate for a degree? ☐ Yes ☐ No
If Yes, indicate the degree you will seek. ☐ Master's degree ☐ Doctoral degree
If No, indicate your reason for requesting nondegree status and the courses you plan to take.

14. PROGRAM APPLIED FOR _____ Indicate program code
Field of Specialization _____ (see page 2 for codes)

2	6						
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15. CITIZENSHIP STATUS
☐ D-Citizen of USA
☐ I -Permanent immigrant, refugee parolee, or displaced person (Proof of "I" status will be requested.)
☐ F -None of the above (foreign)
If you check "I" or "F" indicate:
Country of citizenship _____
Country of birth _____
If you check "F" indicate visa type _____

16. ILLINOIS RESIDENT
An adult who is a US citizen or immigrant, to be considered a resident for purposes of admission, must have been a bona fide resident of the state for a period of at least six consecutive months immediately preceding the term for which he or she is applying.
☐ R-Resident ☐ N-Nonresident

17. Are you currently a staff member of the University? ☐ Yes ☐ No If Yes, complete the following ☐ Academic ☐ Nonacademic

Position % Time Campus Department Office Extension
Have you applied to UICC in the last year but not registered? ☐ Yes ☐ No

18. List ALL colleges, universities, and graduate schools you have attended or are now attending, including the University of Illinois (indicate appropriate campus). Consult the application instructions on page 2 concerning transcripts and supporting credentials required. Forward required official transcripts to the Office of Admissions and Records. A transcript is not considered official unless it is sent to the University directly from the registrar of the institution where courses were completed.

Name of Each Institution Attended (List in reverse chronological order)	City and State	Degrees Received or to Be Received and Dates	Dates of Attendance (Indicate month and year)	
			From	To

19. List all employment (business and professional) experience you have had.

Name and Address of Employer	City and State	Title and Position	Dates	
			From	To

20. List any graduate-level examinations you have taken.

Examination	Date to be Taken	Scores			
GRE		Verbal:	Quant.:	Advanced:	Subject Area:
GMAT		Verbal:	Quant.:	Total:	
TOEFL-ELI		Total:			
Other:					

ALL APPLICANTS, please read the following and sign:

I understand that withholding information requested on this application or giving false information will make me ineligible for admission to the University or subject to dismissal. With this in mind, I certify that the above statements are correct and complete.

Signature

Date

NOTE: NOTIFICATION REGARDING ADMISSION ACTION TAKEN ON THIS APPLICATION IS VALID ONLY WHEN CONFIRMED IN WRITING BY THE OFFICE OF ADMISSIONS AND RECORDS.

Graduate Study

**University of Illinois
at
Chicago Circle**

1979-80

A Message from the Dean

This bulletin has two purposes: to provide information about the campus and to inform students of the general rules governing graduate study at the University of Illinois at Chicago Circle. It is based on the best information available when it was prepared, at the beginning of March 1979. Every effort has been made to insure that the bulletin is accurate, up-to-date, and informative. However, you are reminded that programs, courses, and faculty may change before the opening of the 1979-80 academic year. You should consult the department director of graduate studies and the Timetables for the latest information.

I would appreciate your recommendations for making this publication more useful to you, to your friends and colleagues, and to future graduate students.—*Jan Rocek.*

The University of Illinois policy is to be in full compliance with all federal and state non-discrimination and equal opportunity laws, orders, and regulations, and it will not discriminate against any persons because of race, color, national origin, ancestry, religion, age, sex, handicap, or status as disabled veteran or veteran of the Vietnam era. This nondiscrimination policy applies to admissions, access to, treatment, and employment in the University programs and activities. Vice President Ronald W. Brady has been designated as the University equal opportunity officer for the University of Illinois. For additional information on the equal opportunity and affirmative action policies of the University of Illinois at Chicago Circle, please consult Richard M. Johnson, Vice Chancellor for Academic Affairs, or Richard H. Ward, Vice Chancellor for Administration.

Graduate College
1523 University Hall
University of Illinois at Chicago Circle
Box 4348, Chicago, Illinois 60680

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1979/80

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Calendar of Graduate College

1979-80

Fall Quarter 1979

September 11-13, Tu-Th
 September 17, M
 September 28, F
 October 8, M
 October 12, F

October 26, F

November 21, W
 November 22-23, Th-F
 November 26-30, M-F

Registration
 Instruction begins
 Last day to add a course
 Columbus Day (no classes)
 Last day to file #10 degree card for addition to fall quarter graduation list
 Last day to drop a course
 Last day for Graduate College approval of format of fall quarter theses and dissertations
 Instruction ends
 Thanksgiving (no classes)
 Final examinations

Winter Quarter 1980

December 11-12, Tu-W
 January 2, W
 January 11, F
 February 1, F

February 8, F

February 18, M
 March 7, F
 March 10-14, M-F

Registration
 Instruction begins
 Last day to add a course
 Last day to file #10 degree card for addition to winter quarter graduation list
 Last day to drop a course
 Last day for Graduate College approval of format of winter quarter theses and dissertations
 Presidents Day (no classes)
 Instruction ends
 Final examinations

Spring Quarter 1980

March 18-19, Tu-W
 March 24, M
 April 3, Th
 April 4, F
 April 18, F

May 2, F

May 29, Th
 May 30, F
 June 2-6, M-F
 June 8, Su

Registration
 Instruction begins
 Last day to add a course
 Holiday (no classes)
 Last day to file #10 degree card for addition to spring quarter graduation list
 Last day to drop a course
 Last day for Graduate College approval of format of spring quarter theses and dissertations
 Instruction ends
 Memorial Day (no classes)
 Final examinations
 Commencement

Summer Session 1980

June 10-11, Tu-W
 June 16, M
 June 27, F
 July 4, F
 July 11, F

July 18, F

August 6, W
 August 7-8, Th-F

Registration
 Instruction begins
 Last day to add a course
 Independence Day (no classes)
 Last day to file #10 degree card for addition to summer session graduation list
 Last day to drop a course
 Last day for Graduate College approval of format of summer session theses and dissertations
 Instruction ends
 Final examinations

1980-81*Fall Quarter 1980*

September 16-18, Tu-Th	Registration
September 22, M	Instruction begins
October 3, F	Last day to add a course
October 13, M	Columbus Day (no classes)
October 17, F	Last day to file #10 degree card for addition to fall quarter graduation list
October 31, F	Last day to drop a course
	Last day for Graduate College approval of format of fall quarter theses and dissertations
November 26, W	Instruction ends
November 27-28, Th-F	Thanksgiving (no classes)
December 1-5, M-F	Final examinations

Winter Quarter 1981

December 16-17, Tu-W	Registration
January 5, W	Instruction begins
January 16, F	Last day to add a course
January 30, F	Last day to file #10 degree card for addition to winter quarter graduation list
February 13, F	Last day to drop a course
	Last day for Graduate College approval of format of winter quarter theses and dissertations
February 16, M	Presidents Day (no classes)
March 13, F	Instruction ends
March 16-20, M-F	Final examinations

Spring Quarter 1981

March 24-25, Tu-W	Registration
March 30, M	Instruction begins
April 10, F	Last day to add a course
April 16, TH	Last day to file #10 degree card for addition to spring quarter graduation list
April 17, F	Holiday (no classes)
May 8, F	Last day to drop a course
	Last day for Graduate College approval of format of spring quarter theses and dissertations
May 25, M	Memorial Day (no classes)
June 5, F	Instruction ends
June 8-12, M-F	Final examinations
June 14, Su	Commencement

Summer Session 1981

June 16-17, Tu-W	Registration
June 22, M	Instruction begins
July 3, F	Independence Day (no classes)
July 6, M	Last day to add a course
July 17, F	Last day to file #10 degree card for addition to summer session graduation list
July 24, F	Last day to drop a course
	Last day for Graduate College approval of format of summer session theses and dissertations
August 12, W	Instruction ends
August 13-14, Th-F	Final examinations

Board of Trustees of the University of Illinois

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Ralph C. Hahn
George W. Howard III
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Arthur Velasquez

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Director, Admissions and Records	Jane W. Loeb
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Graduate Units at Chicago Circle

Anthropology: MA

Sylvia J. Vatuk, Chairperson
3102A Behavioral Sciences Building
Waud H. Kracke, Director of Graduate Studies
3148D Behavioral Sciences Building
(312) 996-2534

Architecture: MArch

Specializations in architectural design, building science, environmental studies, and urban design.
Richard R. Whitaker, Director of the School of Architecture
106 Jefferson Hall
Edward L. Deam, Director of Graduate Studies
106 Jefferson Hall
(312) 996-3335

Art: MFA

Morris Barazani, Acting Director of the School of Art and Design
306 Jefferson Hall
Nancy D. Berryman, Director of Graduate Studies
306 Jefferson Hall
(312) 996-3337

Bioengineering: MS, PhD

Irving F. Miller, Head of the Program and Director of Graduate Studies
1027 Science and Engineering Offices
(312) 996-2335

Biological Sciences: MS, DA, PhD

Stanley K. Shapiro, Head
3238 Science and Engineering South
Dennis Nyberg, Director of Graduate Studies
3448 Science and Engineering South
(312) 996-2211

Business Administration: MAS

Specialization in business enterprise administration: accounting systems, economics, financial systems, human resource management, information systems, marketing systems, and policy and administrative practice.
Ralph Westfall, Dean of the College of Business Administration
2528 University Hall
Alvin D. Star, Director of Graduate Studies
2500 University Hall
(312) 996-2494
Tracy A. Tripp, Director,
MAS Program in Business Administration
2504 University Hall
(312) 996-4573

Chemistry: MS, DA, PhD

Specializations in organic, inorganic, and physical chemistry.
William F. Sager, Head
4508 Science and Engineering South
Jacques Kagan, Director of Graduate Studies
4136 Science and Engineering South
(312) 996-3161

Communication and Theater: MA

Specializations in communication, mass communication, and theater.
Anthony Graham-White, Head
1024 Education and Communications Building
Barbara S. Wood, Director of Graduate Studies
1021 Education and Communications Building
(312) 996-3187

Criminal Justice: MA, MS

Specializations in criminal justice (MA) and criminalistics (MS).
James W. Osterburg, Head
4041 Behavioral Sciences Building
David Fogel, Director of Graduate Studies
4050A Behavioral Sciences Building
(312) 996-5290

Economics: MA, MAS, PhD³

MA specializations in urban and quantitative economics; PhD specialization in economic policies.
Richard Kosobud, Head
2101 University Hall
Houston H. Stokes, Director of Graduate Studies
2107 University Hall
(312) 996-2683

Education: MEd, PhD³

PhD in education policy; MEd specialization in instructional leadership, special education, and policy evaluation research.
Maurice J. Eash, Dean of the College of Education and Director of Graduate Studies
3009 Education and Communications Building
(312) 996-4532

Energy Engineering: MS, PhD

Specializations in chemical engineering, environmental engineering, fluids engineering, and thermomechanics and energy conversion.

Paul M. Chung, Head

912 Science and Engineering Offices
Joseph C.F. Chow, Director of Graduate Studies
935 Science and Engineering Offices
(312) 996-3425

English: MA

Specializations in literature, creative writing, and the teaching of English.
Jay A. Levine, Head
2333 University Hall
Gloria G. Fromm, Director of Graduate Studies
2300 University Hall
(312) 996-3260

French: MA¹

David J. O'Connell, Head
1431 University Hall
Marie-Odile Sweetser, Director of Graduate Studies
1417 University Hall
(312) 996-3222

Geography: MA

Specializations in urban geography, regional development, and environmental studies.
Clifford E. Tiedemann, Head
2102A Behavioral Sciences Building
Siim Soot, Director of Graduate Studies
2138D Behavioral Sciences Building
(312) 996-3112

Geological Sciences: MS, PhD²

Specializations in crystallography, mineralogy, petrology, geochemistry, paleontology, oceanography, sedimentology, structural geology, hydrology, and sedimentary geochemistry.
Norman D. Smith, Acting Head
2446 Science and Engineering South
August Koster van Groos, Director of Graduate Studies
2468 Science and Engineering South
(312) 996-3155

German: MA, PhD¹

Specializations in German literature; German philology and linguistics.
Leroy R. Shaw, Acting Head and Director of Graduate Studies
1601 University Hall
(312) 996-3205

History: MA, MAT, PhD

PhD specializations in Africa, Britain since 1485, Europe 1450-1815, Europe since 1648, France, Italy, Latin America, Russia, United States 1500-1877, and United States since 1765.

MA and MAT specializations in Africa, ancient world, early modern Europe, East Asia, Great Britain, Latin America, medieval Europe, modern Europe, Russia and East Europe, and United States.
Leo Schelbert, Chairperson
727 Science and Engineering Offices
Edward C. Thaden, Director of Graduate Studies
701 Science and Engineering Offices
(312) 996-3141

Information Engineering: MS, PhD
Specializations in computer and information science, electrical engineering, health-care delivery systems, industrial automation.
Bruce H. McCormick, Head
1112 Science and Engineering Offices
P.L.E. Uslenghi, Director of Graduate Studies
1111 Science and Engineering Offices
(312) 996-3422

Linguistics: MA
Specializations in theoretical and applied linguistics, including TESOL.
Andrew Schiller, Head
1500 University Hall
Dale E. Woolley, Director of Graduate Studies
1514 University Hall
(312) 996-5334

Materials Engineering: MS, PhD
Specializations in metallurgy, soil mechanics and foundations, structures (including concrete technology), and engineering mechanics.
Ernest F. Masur, Head
812 Science and Engineering Offices
Surendra P. Shah, Director of Graduate Studies
837 Science and Engineering Offices
(312) 996-3428

Mathematics: MA, MS, MST, DA, PhD
Philip Dwinger, Head
312 Science and Engineering Offices
Neil W. Rickert, Director of Graduate Studies
325 Science and Engineering Offices
(312) 996-3041

Philosophy: MA, PhD
Myles Brand, Chairperson
1801 University Hall
Ralf Meerbote, Director of Graduate Studies
1820 University Hall
(312) 996-3023

Physical Education: MS
Specializations in administration of physical education and sports, psychomotor learning, exercise physiology, and physical education for the atypical.
Wilma Pesaveño, Acting Head
336 Physical Education Building
Marian E. Kneer, Director of Graduate Studies
334 Physical Education Building
(312) 996-4600

Physics: MS, DA, PhD
Specializations in atomic and molecular physics, high energy physics, nuclear physics, solid state physics, and theoretical physics.
Paul M. Raccah, Head

2244 Science and Engineering South
James Kouvel, Director of Graduate Studies
2368 Science and Engineering South
(312) 996-3400

Political Science: MA, MAS, PhD,¹ PhD³
Specializations in political analysis, public policy, public agency administration, and urban politics.
Frank Tachau, Chairperson
1102A Behavioral Sciences Building
John A. Gardiner, Director of Graduate Studies
1126C Behavioral Sciences Building
(312) 996-3105
John Wanat, Director, MAS Program in Public Agency Administration
1126B Behavioral Sciences Building
(312) 996-3110

Psychology: MA, PhD
I.E. Farber, Chairperson
1066B Behavioral Sciences Building
Leon Miller, Director of Graduate Studies
1018C Behavioral Sciences Building
(312) 996-2434

Public Agency Administration: MAS
Specializations in public agency administration. This is a joint program of the College of Business Administration; the School of Urban Sciences in the College of Architecture, Art, and Urban Sciences; and the Department of Political Science in the College of Liberal Arts and Sciences.
John Wanat, Director, MAS Program in Public Agency Administration
1126B Behavioral Sciences Building
(312) 996-3110

Public Policy Analysis: PhD
Specialization in economic policies, educational policy, politics of public policy for careers as policy analysts in public and private agencies concerned with urban-related policy issues and in teaching or research.
John A. Gardiner, Director of Graduate Studies
1126C Behavioral Sciences Building
(312) 996-3105

Quantitative Methods: MA, MAS
Specialization in quantitative economics.
Leonard Kent, Head
2400 University Hall
Edward Minioka, Director of Graduate Studies
2415 University Hall
(312) 996-2676

Slavic Languages and Literatures: MA
Specializations in Russian cultural heritage, Polish cultural heritage, and Slavic linguistics, with individual options in Ukrainian, Serbian, and Czech studies.
Nicholas Moravcevic, Head
1230 University Hall
Lauren G. Leighton, Director of Graduate Studies
1216 University Hall
(312) 996-4412

Social Work: MSW, DSW
Shirley M. Buttrick, Dean of the Jane Addams College of Social Work
4503 Education and Communications Building
Almera Lewis, Dean of Students
4535 Education and Communications

Building
(312) 996-3218

Sociology: MA, PhD
Specializations in social psychology, medical sociology, and the sociology of political and economic organization.
David P. Street, Head
4112E Behavioral Sciences Building
Wayne J. Villemez, Director of Graduate Studies
4112C Behavioral Sciences Building
(312) 996-3005

Spanish: MA
Specializations in language, literature, and culture of the Spanish-speaking people.
Audrey Lumsden-Kouvel, Acting Head
1733 University Hall
Jerry Rank, Director of Graduate Studies
1713 University Hall
(312) 996-3236

Systems Engineering: MS
Specializations in industrial engineering, operations research, systems analysis, and urban systems engineering.
Irving F. Miller, Acting Head
1012 Science and Engineering Offices
Gyan C. Agarwal, Director of Graduate Studies
1031 Science and Engineering Offices
(312) 996-3443

Urban Planning and Policy: MAS, MUPP, PhD³
MUPP specializations in urban policy, community development, health planning, educational planning, public agency administration, and urban design planning. PhD specialization in human services and physical resources policy.
Robert L. Crowson, Jr., Acting Director of the Program
1140A Behavioral Sciences Building
Robert Mier, Director of Graduate Studies
1141 Behavioral Sciences Building
(312) 996-2225

Graduate *courses* are offered in some departments that do not yet offer a degree program; they are available to all graduate students as electives.

For additional information about programs listed in this bulletin, correspond directly with the appropriate department at the listed address.

1. Intercampus degree program offered in cooperation with the Urbana-Champaign campus of the University of Illinois.
2. PhD in Engineering offered in cooperation with the College of Engineering.
3. PhD in Public Policy Analysis offered cooperatively by the Departments of Economics and Political Science, the School of Urban Sciences, and the College of Education.

Graduate College Directory

General Information	1523 University Hall	Ext. 3320
Admissions, Registration, Nondegree Students, Petitions, Inter-campus Programs	1524 University Hall	Ext. 3325
Research Board and Fellowships	1529 University Hall	Ext. 3344
Theses and Records	1515 University Hall	Ext. 3320
Jan Rocek, Dean	1530 University Hall	Ext. 3313
David Bardack, Associate Dean	1518 University Hall	Ext. 3314
William J. Otting, Associate Dean	1531 University Hall	Ext. 3344
Assistant Dean	1524 University Hall	Ext. 3325
Paula Swanson, Assistant to the Dean	1526 University Hall	Ext. 3313
Thelma Meyers, Staff Associate	1517 University Hall	Ext. 3320
Barbara Bulanda, Theses and Records	1515 University Hall	Ext. 3320
Research Support Information Center	1527 University Hall	Ext. 2674
Richard Buchanan, Assistant Director, Sponsored Research	1527 University Hall	Ext. 2674

Executive Committee of the Graduate College

Jan Rocek, PhD, Dean of the Graduate College, Professor of Chemistry
 Tanis Bryan, PhD, Associate Professor of Education (1978-80)
 Antonio Camacho, PhD, Professor of Economics (1977-79)
 Michael R. Cummings, PhD, Associate Professor of Biological Sciences (1977-79)
 Leonard J. Currie, MArch, Professor of Architecture (1978-80)
 Sumati N. Dubey, DSW, Professor of Social Work (1978-80)
 Gloria G. Fromm, PhD, Professor of English (1978-80)
 Robert L. Hall, PhD, Professor of Anthropology (1978-80)
 Robert Heitner, PhD, Professor of German (1978-79)
 Peter D'A. Jones, PhD, Professor of History (1978-80)
 Stephen J. Krieger, PhD, Professor of Physics (1977-79)
 Edward T. Minieka, PhD, Associate Professor of Quantitative Methods (1978-80)
 Satish C. Saxena, PhD, Professor Energy Engineering (1977-79)
 Herbert Stenson, PhD, Associate Professor of Psychology (1977-79)
 Barbara Wood, PhD, Professor of Communication and Theater (1977-79)

Research Board

Gershon B. Berkson, PhD, Professor of Psychology
 Benjamin Bouck, PhD, Professor of Biological Sciences
 Richard Carlin, PhD, Professor of Chemistry
 Roland Ginzel, MFA, Professor of Art
 John McDonald, PhD, Associate Professor of Economics
 Donald McLeod, PhD, Professor of Physics
 Lawrence Poston, PhD, Professor of English
 Piergiorgio Uslenghi, PhD, Professor of Information Engineering

Awards Committee

Robert E. DeMar, PhD, Professor of Biological Sciences
 George Dickie, PhD, Professor of Philosophy
 David A. Foulser, PhD, Professor of Mathematics
 John Mellon, EdD, Associate Professor of English
 John Nicolette, PhD, Associate Professor of Biological Sciences
 Joan Shireman, PhD, Associate Professor of Social Work
 Gerald Strom, PhD, Associate Professor of Political Science

Campus History and Information

On February 22, 1965, the University of Illinois at Chicago Circle opened its doors at its permanent location, which takes its name from the nearby transportation interchange symbolic of the flow of people within the urban region.

The move from Navy Pier, site of the University's Chicago Undergraduate Division for nineteen years, signaled the emergence of the principal public university at the service of—and in the midst of—the state's major population center.

Just as the physical growth of the University of Illinois at Chicago Circle was designed to answer the emphatically stated educational needs of the area's citizens, so have the instruction, research, and public service programs been organized, regularly reviewed, and improved to meet these expressed needs.

One of the historic qualities of the University of Illinois is its ability to integrate the research and public service activities of its faculty, staff, and student body with its educational programs. In the setting of Chicago Circle, this capability points to professional fields and disciplines that have high impact upon urban life while maintaining a commitment to

a wide range of programs fundamental to the development of specialized inquiry.

Other University of Illinois facilities in Chicago are at the Medical Center, which houses the Colleges of Medicine (including the Abraham Lincoln School of Medicine, the School of Basic Medical Sciences, and the School of Associated Medical Sciences), Dentistry, Nursing, and Pharmacy and the Health Sciences Division of the Graduate College; the School of Public Health; and the 600-bed University of Illinois Hospital.

Location, Mailing Address, and Transportation

The Chicago Circle campus is located just south and west of the Loop in an area bounded by the Eisenhower and Ryan Expressways, Racine Avenue, and Roosevelt Road. The mailing address is Box 4348, Chicago, Illinois 60680. Transportation to the campus is by way of the CTA El-subway, which has built a special "University of Illinois-Halsted" station, and by the buses on Halsted, Harrison, and Taylor Streets and on Roosevelt Road.



Graduate Studies at Chicago Circle

The first thirteen graduate programs were established at the University of Illinois at Chicago Circle in September 1967. At the beginning of the 1979-80 academic year, master's degrees in 38 fields and doctor's degrees in 20 will be offered. Some degrees are offered as intercampus programs in cooperation with the Medical Center and Urbana-Champaign campuses of the University of Illinois. Additional graduate programs are being developed for the future. For a list of graduate units at Chicago Circle and degrees offered, see *Graduate Units at Chicago Circle*.

Directors of Graduate Studies

Each graduate program has a director of graduate studies whose responsibilities include evaluating and processing applications for admission to the Graduate College; advising graduate students on programs of study and department rules and procedures; informing graduate students and advisers about the availability of assistantships, fellowships, and other financial aid; and evaluating student progress. Directors of graduate studies are listed in *Graduate Units at Chicago Circle*.

Graduate Student Advisory Committee

Consisting of one student from each graduate program, this committee advises the Dean of the Graduate College on all matters of concern to graduate students and serves as a link between the staff of the Graduate College and the graduate student members of the Executive Committee of the Graduate College and other campus committees. Elections are held in the spring quarter. Many graduate programs also have active graduate student associations. Interested students should consult their director of graduate studies for further information.

Master's Programs

A master's degree provides advanced professional training and is the degree required for entry to many types of professional careers.

Many master's programs at Chicago Circle have been designed to make it possible for a full-time student to complete the degree requirements in three quarters of study or a single academic year. However, many students with assistantships or with part-time employment outside the University take a longer period to obtain their degrees, and some programs—administrative science, social work, and urban planning and policy, for example—require up to two years of study.

Nine types of master's degrees are offered at Chicago Circle: the Master of Administrative Science, the Master of Architecture, the Master of Arts, the Master of Education, the Master of Fine Arts, the Master of Science, the Master of Arts or Science in Teaching (History and Mathematics), the Master

of Social Work, and the Master of Urban Planning and Policy. Additional information on admissions, degree requirements, and particular programs can be found in *Admission, Academic and General Regulations*, and *Departments and Programs*.

Doctoral Programs

The doctorate is primarily a research degree. The candidate must demonstrate a capacity for independent research by presenting an original thesis on a topic within a major field of study. Only the most highly qualified students are encouraged to apply for admission.

The University of Illinois at Chicago Circle offers doctoral work in twenty fields and grants three doctoral degrees—the Doctor of Arts, the Doctor of Philosophy, and the Doctor of Social Work.

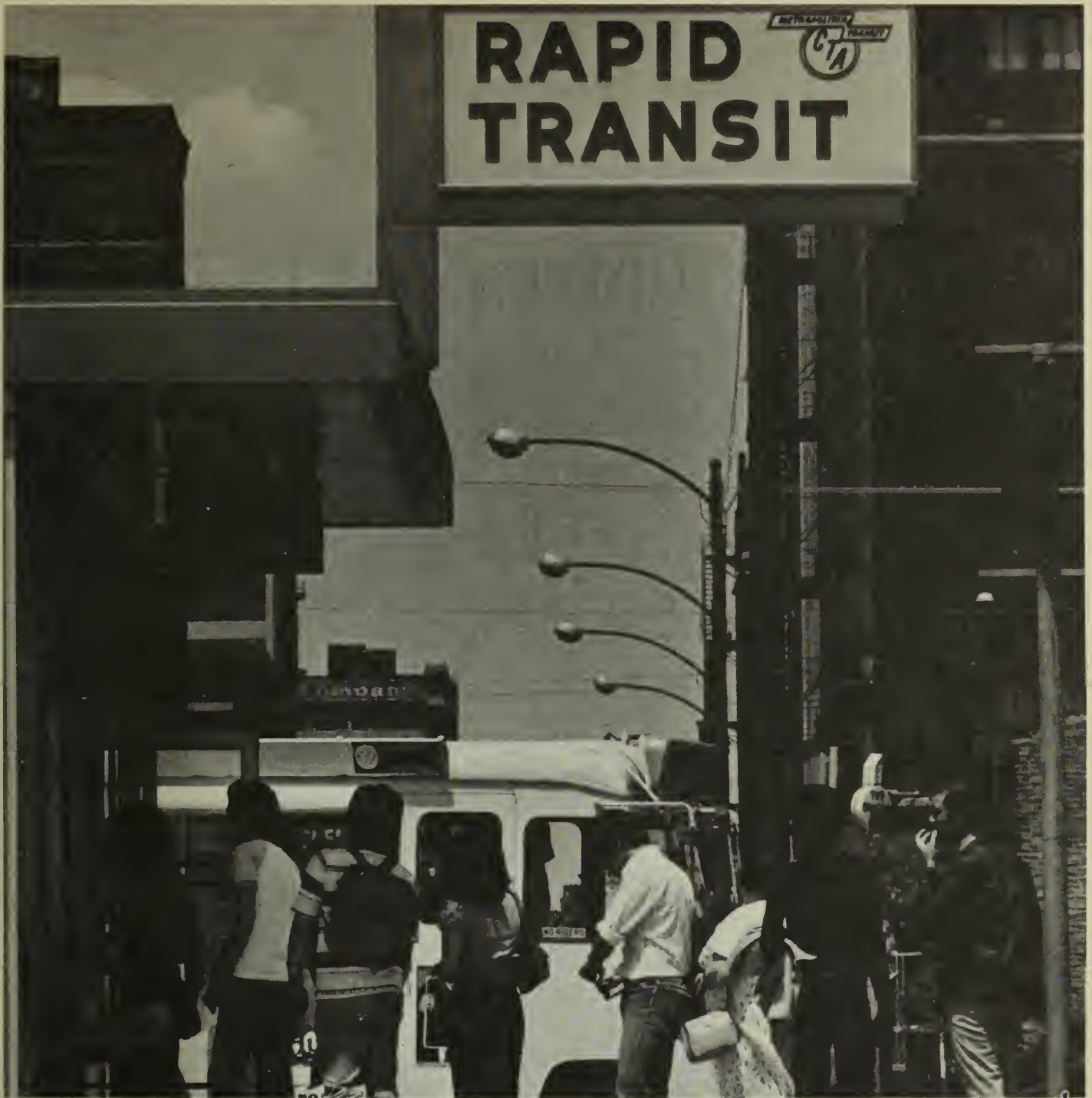
The *Doctor of Arts* is a professional degree for college teachers and instructional designers. It combines the rigor and high level of scholarship in the subject matter of the Doctor of Philosophy with the acquisition of special skills in modern instructional methods. The program is designed to provide training through special courses and thesis research in such areas as curriculum design, teaching methodology, the creation of instructional materials, and educational evaluation. The development of computer-assisted instruction is particularly emphasized. Holders of a Doctor of Arts are expected to make original contributions to the knowledge and understanding of these areas as they apply to their chosen disciplines and are also expected to remain active researchers and innovators in linking advances in their disciplines to the college classroom.

The Doctor of Arts is offered in the Departments of Biological Sciences, Chemistry, Mathematics, and Physics. Additional programs are being developed. Students apply to the discipline department for admission and, once admitted to the department, choose an adviser. Together they prepare a plan of doctoral studies.

Further information can be obtained from the director of graduate studies in the appropriate department.

The *Doctor of Philosophy* at Chicago Circle places traditional emphasis on the advancement of knowledge through independent research in the candidate's chosen field and the presentation of an original thesis. The degree is intended primarily for those who need the highest level of research training and who wish to pursue careers in colleges and universities, research institutes, and public agencies or industrial and business organizations. Within the general framework of the degree requirements, each plan of study and research is tailored to the candidate's particular needs and goals and is worked out in close consultation with the adviser and director of graduate studies.

Prospective students should consult the department listings in this bulletin for information on admissions and degree requirements, courses of instruction and areas of special-



ization offered, and lists of graduate faculty.

The *Doctor of Social Work* is an advanced professional degree. The program offered by the Jane Addams College of Social Work at Chicago Circle is interdisciplinary and strongly emphasizes research. It provides preparation for leadership in teaching, research, social policy analysis and development, and social welfare administration. Although most students admitted to the program are holders of the Master of Social Work and have some professional practice experience, applications from persons with advanced training in other human service professions or a baccalaureate in related social sciences are considered. An optional part-time DSW program is available for employed applicants who hold the MSW.

Campus Hours

Hours of instruction at UICC begin 8 a.m. and run throughout the day until 10 p.m. Many departments offer classes in the late afternoon and evening hours and some units such as the College of Business Administration, the College of Education, the College of Engineering, the Jane Addams College of Social Work, and the School of Urban Sciences provide an array of courses sufficient to enable students to obtain graduate degrees by attending classes at these hours. Many other academic units offer courses in Program PM.

Research Facilities and Opportunities

The Chicago area provides a wide range of research facilities and opportunities for graduate students. Among the better known are the American Bar Foundation, the Argonne National Laboratory, the Art Institute of Chicago, the Center for Research Libraries, the Chicago Historical Society, the Chicago Municipal Reference Library, the Cook County Law Library, the John Crerar Library, the Field Museum of Natural History, the Library of International Relations, the Museum of Negro History, the National Accelerator Laboratory, and the Newberry Library.

The various units of the University of Illinois at the Medical Center cooperate with the Chicago Circle Departments of Bioengineering, Biological Sciences, Chemistry, Information Engineering, Materials Engineering, Physics, Psychology, Sociology, and Systems Engineering; the School of Urban Sciences; the College of Education; and the Jane Addams College of Social Work in encouraging joint graduate study, seminars, and the use of the Medical Library.

Many Chicago Circle units have close working relationships with public and private agencies, enabling graduate students to meet some of their degree requirements through internships, field work, and similar cooperative arrangements. Graduate students also have opportunities to work as members of research groups led by faculty members.

Research Facilities at Chicago Circle

Architecture and Art

Students in the Master of Architecture and Master of Fine Arts programs have access to a wide range of facilities, including fully equipped wood, metal, and plastic working shops, a prototype building area, film-making equipment, photographic laboratories, video-electronics equipment, a typesetting and printing shop, lithograph and etching presses, a sculpture workshop, ceramic kilns, and a hybrid computer system with display scope and image processor. The Resource Center has a collection of reference books, slides, reproductions, periodicals, catalogs, and videotapes and other visual materials.

Behavioral Sciences Building

The Behavioral Sciences Building houses research laboratories and other facilities for studies in a wide range of disciplines and fields—from anthropology to urban sciences. Some research activities are carried on through centers and institutes or are supported by interdisciplinary facilities and are described in greater detail in this section. Other research activities are carried on through facilities provided within the departments.

The Department of Anthropology has three laboratories supporting studies in archeology, linguistics, and physical anthropology. These laboratories house a wide range of equipment, including microscopes, tape recorders, VTR and

16mm filming equipment, soil core apparatus, differential thermoanalysis equipment, and dissecting tables.

The Department of Geography has extensive laboratory and darkroom facilities supporting studies in quantitative methods, cartography, soil analysis, and climatology. The facilities include five CRT terminals for on-line interaction with two campus IBM 370 system, a co-ordinate digitizer and keypunch machine, and a computer program library to support the programs in mapping and spatial analysis of the Cartographic Laboratory and the Chicago Area Geographic Information Study (CAGIS). CAGIS is a summary tape-processing center for the US Bureau of the Census and engages in contract research pertaining to the development and analysis of small area data as well as geographic information systems for private-sector corporations and public sector agencies at the local, state, and national levels of government. Senior personnel at CAGIS also hold appointments in the Center for the Study of Patient Care and Community Health.

The Department of Political Science has a Political Data Center that is part of the Inter-University Consortium for Political Research and provides faculty and students with access to data from national studies of political attitudes and behavior conducted over the past two decades. The department also has calculators, key punch and card-sorting equipment, and an on-line link to the UICC Computer Center.

The Department of Psychology has the facilities for research on all phases of human and animal learning, language, problem-solving, brain processes, perception, social interaction, attitude formation and measurement, child and infant development, developmental disabilities, industrial psychology, and clinical psychology. General and special purpose computer facilities are available for programming, recording, and data analysis. A special division of the department, the Office of Applied Psychological Services, accepts referrals from schools, hospitals, and other private and government agencies for diagnostic testing, interventive treatment, and organizational evaluation, as part of the department's research, training, and public service activities.



The Department of Sociology has a research methods laboratory containing electronic calculators, a demography laboratory containing statistical resource materials and desk calculators, and an experimental sociology laboratory with rooms for observation and interviewing. Direct access to the University computer system is provided by two remote interactive terminals.

The Office of Social Science Research (OSSR) provides a variety of research supporting services that are shared by the social and behavioral science departments. The central aim of OSSR is to facilitate research and publication in the social and behavioral sciences. Among the services provided on request are: (1) audio and video recording and playback, including technical assistance in equipment use, (2) laboratory space for experiments and interviews, (3) a remote terminal for access to the central campus computer, including free consulting services, (4) advice and assistance in locating needed data and in data archiving, and (5) consultation and assistance in seeking outside grant support. Other services can sometimes be provided in response to individual applications, including such things as temporary research assistance for clerical, coding, or bibliographic work; typing of research manuscripts; provision of minor research supplies; and travel to research sites. For information, phone 996-8778.

In addition to the computing facilities and terminals maintained by individual departments in BSB, a major remote computing facility is located in B001 BSB. In addition to numerous CRT and hard-copy terminals, a high-speed remote printing facility, connected to the main Computer Center, is available for batch output. Consultant and staff members of the Computer Center are also available to assist students and faculty members with their computer-related problems. (For additional information refer to the Computer Center.)

The data archiving services are coordinated by the Political Data Center (1129 BSB). These services include obtaining datasets and setting them up for faculty use, keeping faculty abreast of additions to the data library, and consulting with faculty. A graduate research assistant aids in providing these services.

Center for Research in Criminal Justice

The center organizes, conducts, and supports a wide range of research in criminal justice. For purposes of research, the field of criminal justice consists of four arenas of practical and theoretical concern: the community, the police, courts, and corrections. Each of these, in turn, may be subdivided into many dimensions: individual, subgroup, and societal; male, female, adult, and juvenile; etiological, descriptive, preventive, therapeutic, and evaluational; local, state, regional, national, and international. The general research orientation of the center is empirical and its methods are both qualitative and quantitative.

Center for Urban Studies

The Center for Urban Studies, within the School of Urban Sciences, is a multidisciplinary research center that attracts faculty from across the campus. It focuses on applied and theoretical research and engages in substantial community service activity. Every effort is made to involve students with faculty in both research and service. Faculty and students associated with the center have successfully undertaken research in urban growth patterns, land use, environment, transportation, education, housing, health services, manpower training, welfare and income maintenance, and state and municipal finance. Special emphasis is placed on understanding the systemic relationships between various urban functions and activities. A recent major activity of the center is the establishment of a Program for Urban Economic Development,

largely supported by a grant from the US Economic Development administration. It is expected to provide important technical support services to public, private, and community bodies in such areas as information sharing, technology transfer, and management assistance and counseling. The program will assist in the identification and allocation of resources for economic development and provide staff support for projects to promote the retention and expansion of existing industry and commerce.

Computer Center

The Computer Center provides the campus with its central research and instructional computing facility. Services available include a powerful general-purpose time-sharing system (WYLBUR) to prepare manuscripts, thesis, and other documents and, in place of keypunches, to edit, run, and examine background computer jobs; BATCH service for large background jobs run on an IBM 370/158 computer with the MVS operating system; EXPRESS, for fast turnaround of small background jobs (less than ten minutes for a 10-second FORTRAN program); and BASIC language time-sharing on a dedicated minicomputer.

A large collection of software is available, including most programming languages, mathematical subroutine packages, statistical analysis programs, simulation packages, etc. A data-archiving service stores most data automatically for several years, provides a catalog for archived data, and returns data quickly and easily for use.

Documentation, training, and consultation is available at the Computer Center and at the remote site in the Behavioral Sciences Building on the north side of the campus.

The staff of the Computer Center teaches courses in programming, software design, theory of computation, and numerical analysis in cooperation with the Department of Mathematics and the College of Engineering. The staff also assists other departments in utilizing the equipment for both instruction and research.

Education and Communications Building

The Education and Communications Building houses research and training facilities for the College of Education, the Department of Music, the Jane Addams College of Social Work, and the Department of Communication and Theater.

The College of Education Child Study Facility contains three observation rooms equipped for unidirectional viewing. Included is an inventory of various psychological testing materials for use in activities. An observational classroom has two video systems both to aid in the development of teaching materials and to provide feedback to students in practicums and other classes. The college also houses the Office of Urban Education Research and the Office of Evaluation Research. The research program frees faculty to engage in research on problems of urban education and supports research expenses (graduate assistants, data collection and analysis, for example) incurred by faculty members. Established in 1969 in answer to the increasing demand for evaluation assistance in university, government, and school-related programs, the Office of Evaluation Research is concerned with both theoretical and applied approaches to evaluation.

The Department of Music has well-equipped rehearsal/performance facilities supporting a wide range of instrumental and vocal activities. The department also has stereo listening and recording equipment, a representative collection of recordings, several fine keyboard instruments including a harpsichord, and a microfilm reader.

The Jane Addams College of Social Work has three computer terminals that give students access to the University's data processing system.

The Department of Communication and Theater has a

color-equipped television studio. The theater is designed as an experimental theater permitting the study of a variety of modes of presentation.

Energy Resources Center

The Energy Resources Center at the University of Illinois at Chicago Circle was established by the University Board of Trustees in September 1973 for the purpose of developing close working relationships with state, regional, and local governments, commissions, industrial organizations, and citizens' groups, to assist them in resolving the energy problems currently being encountered in the state of Illinois. The center emphasizes interdisciplinary and multidisciplinary approaches, bringing together faculty, professional staff, and students from many fields of study to seek solutions to energy-related problems.

Funded research projects the center has been actively engaged in over the past year include:

1. USA-USSR Collaborative Research Program, which involves research in thermophysical properties, fluidized beds, rheological transfer processes, and radiation properties of gases.

2. Long-range energy planning for Illinois, which involved technical editing of the reports of six long-range energy study panels for the Illinois Energy Resources Commission. These panels, involving specialists from across the state, were commissioned to prepare long-range energy plans for Illinois in the fields of coal, electric utilities, energy conservation, solar, solid waste and biomass, and petroleum and natural gas.

3. Low-Income Residential Weatherization Program for the Chicago Department of Human Services.

4. Development of a multi-family retrofit methodology for the National Bureau of Standards, US Department of Commerce.

5. Ohio River Basin Energy Study, a technology assessment of the socioeconomic, political, and environmental impacts of energy conversion facilities in the Ohio River Basin up to the year 2000.

6. Study of power plant productivity and reliability in Illinois, in cooperation with the Illinois Commerce Commission.

7. Training and technical assistance for the Community Services Administration low-income Weatherization Program.

Other activities of the center include sponsoring annual energy conferences and assisting groups in organizing energy-related conferences and workshops. In addition, the center publishes the *Illinois Energy Newsletter*, a bimonthly publication reporting on recent developments and research in the energy area in Illinois, and the *CIC Energy Newsletter*, a quarterly publication reporting on energy and environmental activities in the Big Ten universities.

The center receives financial support from several industries in the Chicago area, including Amoco Oil Foundation; Commonwealth Edison Company; Northern Illinois Gas Company; Peoples Gas, Light and Coke Company; and Universal Oil Products Foundation.

Institute for the Study of Developmental Disabilities

The Institute for the Study of Developmental Disabilities was created in 1976 as a joint program of the University and the Illinois Department of Mental Health and Developmental Disabilities for the purpose of promoting research and training activities in the area of disorders of development. Graduate and advanced study opportunities are available through the Departments of Biological Sciences and Psychology. The institute, 1640 W. Roosevelt, contains laboratories for both biological and behavioral research, as well as clinical programs for the developmentally disabled. Among current projects are studies in brain biochemistry, neurophysiology,

nerve growth, neuroembryology, biochemical genetics, and behavioral and physiological aspects of infant and child development. Laboratory resources include extensive computer capabilities, electrophysiologic apparatus, cell and tissue culture facilities, spectrophotometric analysis equipment, and observation rooms with videotaping capability. The institute sponsors lectures, seminars, and workshops in developmental disabilities and serves as a resource center for community agencies and the Illinois Department of Mental Health and Developmental Disabilities.

Institute of Labor and Industrial Relations

The Institute of Labor and Industrial Relations at Urbana-Champaign offers master's and doctoral work and conducts a broad spectrum of research and policy studies. At Chicago Circle the institute's Chicago Labor Education Program provides noncredit classes, conferences, seminars, and educational consultative services to union men and women and to organized labor. A special program is conducted for Hispanic labor union leaders. Special seminars for union leaders, dealing with occupational safety and health, are being conducted under a government grant.

James Woodworth Prairie Preserve

The James Woodworth Prairie Preserve in the northwest suburbs of Chicago contains more than five acres of land, about three-quarters of which is virgin blacksoil tall grass prairie that represents one of the last such undisturbed tracts in northeastern Illinois. The preserve is therefore a priceless and irreplaceable resource for scientific research. A building on the corner of the property contains laboratory facilities and a demonstration room for exhibits and lectures. Graduate student support is available for prairie research.

Libraries

Professors: William B. Ernst, Jr., Beverly P. Lynch, Mary Lynn McCree, Marie A. Rapp (Emeritus), Giles B. Robertson (Emeritus), Louis A. Schultheiss, Billy R. Wilkinson

Associate Professors: Robert J. Adelsperger, Aivars Aistars, Harriet K. Barlow, Aline M. Fairbanks, Mary Lynn Ritzenthaler, Cynthia A. Steinke.

Assistant Professors: Mary Ann Bamberger, Majorie C. Bengtson, Peter K. Clark, Robert A. Daugherty, Wanda V. Dole, Barbara J. Ford, Harry L. Frudd, Deborah H. Hooper, Ann L. Hornbaker, Lucinda L. Hutchinson, Barbara J. Hyncar, Nancy R. John, Martha Kester, James J. Maloney, Mary Beth Marcus, Laura J. Miracle, Robert F. Moran, Jr., Gladys C. Odegard, Karen S. Seibert, Marsha L. Selmer, Pamela C. Sieving, Judith K. Sterling, Carol M. Tobin, Stephen E. Wiberly, Jr.

The library of the University of Illinois at Chicago Circle provides the resources and services to support the various programs of the University through three units: the Main Library, the Science Library, and the Math Library. Leaflets describing the collections and services available in each of these locations are obtainable throughout the library.

The total holdings of the library as of July 1, 1978, are 653,572 books and bound periodicals, 8,000 current journal and serial subscriptions, and 902,700 other items, such as documents, microforms, maps, curriculum materials, music scores and recordings, and pamphlets.

Main Library

The Main Library houses all the materials (books, jour-

nals, documents, microforms) that support work in the humanities, social sciences, and engineering, as well as a growing collection of mathematics books especially related to the social sciences and engineering. The Administrative Office, Collection Development, the Technical Services Division (Cataloging, Acquisitions, Serials), and the Public Services Division (Circulation, Documents, Reference, Manuscripts, Special Collections) are also located in the main building.

Schedules of hours are posted in the first and second floor lobbies.

The *Circulation Department* has the responsibility for maintaining the general collection on open shelves so that individual titles are readily accessible at all times and for supervising the circulation process. Books may be borrowed for varying loan periods through the Circulation Desk. The automated circulation system requires that each borrower have a valid ID card before books may be charged for outside use. The Reserve Desk processes reading lists received from the faculty and circulates heavily used course-related materials for restricted loan periods. The Periodicals-Microforms Desk maintains and services the expanding collection of microforms and provides the readers necessary for their use. College catalogs, newspapers, and current issues of periodicals are also housed at this desk.

The *Reference Department* provides information services and assistance in the use of the library and its collections through the Information Desks. It also assists qualified users in gaining access to other collections. Reference librarians are available at the Information Desks, 8:30 a.m.-9 p.m. Monday-Thursday, 8:30 a.m.-6 p.m. Friday, 10 a.m.-6 p.m. Saturday, and 1-6 p.m. Sunday to assist faculty and students. The Reference Collection includes both general and specialized encyclopedias, handbooks, indices, bibliographies, and other reference tools. The Audio Center has phonodiscs and tapes available for both course and pleasure listening, as well as the necessary listening rooms and equipment. The Curriculum Library maintains and circulates a laboratory collection of curriculum guides, textbooks, juvenile literature, standardized tests, games, kits, and simulations useful to students preparing to teach.

The *Documents Department* administers a collection of publications, both in the original form and in microform, from international, federal, state, and municipal levels. The department contains United Nations documents and nineteenth-century British Parliamentary Papers, serves as a depository for United States federal and Illinois state documents, and is one of twelve regional depositories for HUD 701 planning reports. It also houses the ERIC reports since 1970, which are on microfiche.

The *Manuscript Department* contains the papers and records of individuals and organizations active in the growth and development of Chicago since 1871 and includes collections relating to social welfare, housing, juvenile delinquency, settlement houses, politics, civic organizations, education, labor, and other areas of urban interest. The Chicago Board of Trade has designated the department as the depository for its records, papers, and correspondence and has made them available for research use. The pamphlet collection is primarily political in nature, with publications of socialist and communist organizations, civil liberties groups, trade unions, pacifist groups, Zionist organizations, and independent publishers. The Dr. Preston Bradley Library in Hull-House contains material relating to Jane Addams and Hull-House. The Jane Addams Memorial Collection, also in Hull-House, includes the papers and manuscripts of individuals and organizations associated with the settlement house movement in Chicago, as well as books, periodicals, clippings, photographs, and other memorabilia. It is a major resource for the study of reform in the twentieth century. The Midwest Women's Historical Collection contains the papers of women who have made important contributions to the

development of the region. The University Archives, housed with the Manuscripts Department, serve as the repository for the official records of the University and its organizations, the personal papers of the faculty and administrative staff, and University publications.

The *Special Collections Department* houses library materials that require special care because of format, value, uniqueness, or irreplaceability. The Rare Book Room has collections on modern architecture, slavery, seventeenth-century French history, modern poetry, Georgian poetry, literary first editions, early dictionaries, fantastic fiction, and Chicago authors. The Map Section is a depository for maps of the US Geological Survey and the Defense Mapping Agency Topographic Center and contains geologic, economic, political, and other thematic maps and atlases. The collection of maps of the Russian Empire and the pre-1900 maps of the Great Lakes region are housed in the Rare Book Room.

Science Library

The Science Library, third floor, Science and Engineering South, houses the materials needed in support of programs in astronomy, the biological sciences, chemistry, the geological sciences, and physics. In addition to monographs, bound periodicals, and current subscriptions in the pure sciences, the collection contains selected monographs in science-related and general reference areas, as well as abstracts and indices covering the pure sciences, selected government documents, maps, and microforms.

Math Library

The Math Library, 430 Science and Engineering Offices, contains the major portion of the library's holdings in mathematics, including books, periodicals, current journal subscriptions, and a small collection of microfilm. Reserve materials for all mathematics courses are maintained here.

Access to Scholarly Resources

The library has entered into a number of cooperative arrangements with other libraries.

Interlibrary Loan Service is offered to faculty and graduate students engaged in research through the Interlibrary Loan Office in the Main Library and through the Science Library. Conditions under which material may be borrowed are regulated by the Interlibrary Loan Code of the American Library Association and by the individual lending libraries. Procedures for using this service are outlined in the leaflet on interlibrary loan.

UICC students also have borrowing privileges at the Urbana-Champaign and Medical Center campuses. These collections may be accessed either in person or through the Library Computer System (LCS). Titles can be located at any one of the three campuses by using terminals conveniently placed in public service areas of UICC's Main, Science, and Math libraries. Borrowing requests, however, should be initiated at the circulation desks in each library. A shuttle service operating among the three campuses brings requested items to the Main Library Circulation Desk for patron pick-up. Interlibrary Loan handles requests for titles not available within the University of Illinois system and not available for direct borrowing through one of the cooperative programs noted below.

The library holds memberships in two Chicago-area research libraries—the Center for Research Libraries, which maintains extensive collections of little used research materials, and the John Crerar Library, one of the major science research collections in the country. Access to the Center for Research Libraries is through the Reference Department; access to the John Crerar Library is through the Science Library.

Cooperative programs provide the means of access to many other collections. CODSULI (Council of Directors of State University Libraries in Illinois) has a reciprocal borrowing program. Cards giving access to any of the fourteen state university libraries are available from the Circulation Desk for a special purpose and a limited time. The reciprocal borrowing program of the Chicago Academic Library Council (CALC) makes it possible for faculty and students at Chicago Circle to borrow materials directly from the other participating libraries: Chicago State University, DePaul University (except the Law Library), Governors State University, Kemper Library at the Illinois Institute of Technology, Northeastern Illinois University, and Roosevelt University. Materials are borrowed under the rules and regulations of each individual institution. Loyola University, the remaining CALC member, has not yet joined the reciprocal borrowing program. ILLINET (Illinois Library and Information Network) makes it possible to obtain materials from the reference and research centers and the special resource libraries throughout the state. The Infopass program of the Illinois Regional Library Council provides physical access (not borrowing) to the collections of any of the council's 300 members participating in the program.

The Reference Department in the Main Library has the handbooks and directories of these various libraries and programs available for consultation and can be of assistance in using them effectively.

Office of Instructional Resources Development

The Office of Instructional Resources Development (OIRD) provides a comprehensive and coordinated media service to assist faculty members and teaching assistants in using instructional technology conveniently, efficiently, and effectively. The office consists of two consultative divisions and six operational divisions. It can provide instructors with any service they might want to help improve their teaching, ranging from advice on the instructional design of courses to the delivery and operation of audiovisual equipment in their classroom. The office has been particularly active in supporting the development of the Doctor of Arts Program and works closely with the associated faculty. Thesis students are especially encouraged to utilize the services and facilities provided. For example, a Doctor of Arts thesis in chemistry may involve designing a teaching module in organic chemistry and include video cassettes showing molecular structures and bonding recorded from a computer graphics terminal. There are also opportunities for students to work with the PLATO computer complex or the cinematographic and television production groups.

Physical Education Building

The Human Exercise Physiology Research Laboratory currently has the capability of measuring many body functions including respiratory and cardiovascular profiles, evaluation of levels of fitness, and assessment of maximal aerobic capacity. Laboratory studies focus on specific responses to exercise and training. The laboratory will soon have the capacity to assist research in areas that include skeletal muscle metabolism, endocrinological aspects of exercise, and respiratory and circulatory factors involved in exercise and training. Other laboratories provide facilities to measure the effects of exercise on free fatty acids, lipoprotein lipase, protein kinase, adipose tissue cellularity, body composition, and voluntary food in-take.

Research Support Information Center

The Research Support Information Center in the Graduate College assists both faculty members and graduate students in locating sources of external support for research activities and in preparing proposals for submission. The center, 1527 University Hall, serves as a central depository of information concerning the research funding of governmental agencies and private foundations, i.e., fellowship programs, doctoral dissertation support, research grants, and agency-defined research programs. Perspectives on past and present funding opportunities can be obtained from the back files. The center also has a wide range of periodicals, newsletters, and bulletins to assist faculty and students in identifying funding sources. Editorial assistance is provided for proposals in any stage of preparation. Call 996-2674 for additional information.

Science and Engineering Laboratories, Science and Engineering South

These two buildings provide extensive research facilities for the Bioengineering Program and the Departments of Biological Sciences, Chemistry, Criminal Justice, Geological Sciences, Physics, Energy Engineering, Information Engineering, Materials Engineering, and Systems Engineering. Especially noteworthy are shop facilities, animal quarters, plant growth rooms, transmission and scanning electron microscopes, 80- and 90-megahertz NMR, ESR, analytical mass, and high-resolution infrared visible and ultraviolet spectrometers, ORD apparatus, liquid scintillation counters, preparative ultracentrifuges, walk-in incubators and cold rooms, an automatic X-ray diffractometer, molecular beam apparatus, scanning machines, spark chamber readout systems, facilities for chemical and physical forensic studies, high-pressure high-temperature hydrothermal apparatus, gas control furnaces, atomic absorption equipment and allied accessories, and a dory fully equipped for sedimentologic and water column sampling and bathymetry. Experimental facilities for evaluating mechanical, physical, and environmental performances of materials and structural members are also housed in these laboratories.

Survey Research Laboratory

The Survey Research Laboratory of the University of Illinois has facilities on the Chicago Circle and Urbana-Champaign campuses. It offers a wide range of services to faculty and students; to local, state, and municipal agencies; and to various groups working in the public interest. The laboratory conducts mail, telephone, and personal interview surveys throughout Illinois, processes survey data, maintains a social sciences data archive, and maintains a master sample frame for Illinois and its major cities. In addition, the laboratory trains faculty and students in survey methods, advises investigators on all phases of survey research and data analysis, and assists in the design of survey practice. The remote computer facilities of the laboratory include three CRT terminals for on-line interaction with the campus IBM 370 system.

Urban Systems Laboratory

The Urban Systems Laboratory in the College of Engineering is an applied research and problem-solving unit concerned with multidisciplinary studies involving technological as well as social and economic aspects of urban systems. Of particular interest are the infrastructure urban systems, especially the transportation, communication, shelter, environment, service delivery, and physical resources systems. The laboratory is especially concerned with the development and evaluation of alternative methods of improving the performance, utility, efficiency, economy, and responsiveness of urban systems.

Fellowships, Assistantships, and Financial Aid

Various types of financial assistance are available each year to promising students in all fields of study in the Graduate College. Information in this section deals chiefly with aid administered by the University of Illinois. It should be noted, however, that there are also nationally sponsored fellowships that provide support for graduate students, such as the National Science Foundation fellowships. Other fellowships are offered through foundations, industrial concerns, and individuals. Further information and application procedures for nationally sponsored fellowships may be obtained by writing directly to the agency concerned or to the UICC department in which the student plans to major.

The University of Illinois at Chicago Circle offers five basic types of financial aid for graduate students: fellowships, assistantships in teaching and research, tuition-and-fee waivers, loans, and employment. Each type of assistance is described in the following sections. In the administration of these programs and in selecting students for participation in them, the University of Illinois does not discriminate on the grounds of race, creed, color, sex, or national origin of any applicant or participant.

Fellowships

Fellowship stipends are gratuities awarded in recognition of scholarly achievement and promise. They enable students to pursue graduate studies and research without requiring them to render any service. The stipends of different fellowships vary, but with few exceptions they are currently not less than \$2,500 for the nine-month academic year. The fellow's stipend is legally regarded as a gift, not as compensation for services rendered. Funds for income tax purposes are not withheld. Unless explicitly stated otherwise, all fellows whose appointments are administered by the Graduate College are exempt from tuition and fees. A fellow is required to pursue a full program of graduate study (at least 12 hours per term) and may engage in remunerative employment only to the extent permitted by the award or approved in writing by the Dean of the Graduate College.

University Fellowships. Awarded on the basis of an all-campus competition and not restricted to any particular field of graduate study listed in this bulletin, University fellowships are for nine months and carry a stipend of \$2,500, plus exemption from tuition and all regular fees except the Hospital-Medical-Surgical Insurance fee.

Students who receive a University fellowship are also eligible to accept a part-time assistantship related to their field up to a maximum of one-fourth time. Under such an appointment, the fellow's basic stipend remains unchanged and tax-free, but the salary for teaching or research is generally subject to income tax. University fellows, whether they hold a part-time assistantship or not, must carry full programs of graduate study (at least 12 quarter hours per term) unless expressly authorized by the Dean of the Graduate College to carry reduced programs. This course-load requirement may include 499—Thesis Research.

Abraham Lincoln Graduate Fellowships

This program is to expand the overall breadth of background of the UICC graduate student body by increasing the number of students who possess special personal and intellectual qualities and who come from diverse cultural experiences. Applicants from groups that have been and continue to be traditionally underrepresented in the UICC student body will be considered, but this program is open to all eligible nominees of any racial or ethnic background.

Selection of awardees will be based on undergraduate grade point average, grades in key prerequisite courses, and a careful reading of the letters of recommendation and the nominee's personal statement. Weight will also be given to demonstrated personal attributes such as exceptional personal talents, unique work or service experience, leadership potential, maturity, demonstrated compassion, a history of overcoming disadvantage, ability to communicate with the poor, and knowledge and understanding of minority groups.

Applicants must meet the following conditions.

1. They must be citizens or permanent residents of the United States.
2. They must be in their first year of graduate work or must have submitted an application for admission to the Graduate College of the University of Illinois at Chicago Circle.
3. They must plan to carry a full academic load during the period of the fellowship.

An award will include full tuition and fees (except hospitalization) plus a stipend of \$2,500 for the nine-month academic year. The fellowships are not renewable. Recipients of the award who remain in good standing may be offered support through teaching or research assistantships provided by their departments for the following academic year.

Industrial, Endowed, and Special Fellowships. Various industrial firms, foundations, and private individuals have generously donated funds to support a number of special fellowships for graduate students at the University of Illinois. The stipends and supplemental allowances of these fellowships are not uniform, and most of them are restricted to students in particular areas of study. Further information may be obtained from the director of graduate studies in the department in which the student plans to register.

Assistantships

The various departments and programs employ graduate students as either teaching assistants or research assistants. The duties of a teaching assistant usually involve such activities as classroom instruction, supervision of laboratory sections, the guidance of discussion sections, and grading essays, term papers, examinations, and other assignments. Research assistants participate in research activities under the supervision of faculty members. In some instances the work of a research assistant may be related to thesis research; in others it may be entirely different. Although most research assistantships are awarded to graduate students who have completed one or more terms of graduate work at the University

of Illinois, new students are eligible for such appointments. Each assistant is paid a salary for services rendered, and under present ruling, this salary generally is subject to income tax.¹ The weekly clock hours of service required of assistants are 18% for a half-time appointment and the proportional fraction of time for other appointments. Those whose appointments are for between 25 and 67 percent time inclusive are exempt from tuition and all fees except the Hospital-Medical-Surgical Insurance fee.

1. The District Director of Internal Revenue has ruled that under certain conditions income tax need not be withheld from remuneration paid to research assistants engaged in thesis research.

A student holding a half-time assistantship or employed outside the University for an equivalent amount of time is advised to enroll for not more than 12 hours.

Graduate students who hold academic appointments as employees or fellows for the spring quarter and for whom tuition and/or fees have been provided through waiver or through cash payment by an outside agency are entitled to a waiver of the same kinds of tuition and fees for the summer term immediately following, provided they do not hold appointments during the summer term.

Tuition-and-Fee Waivers

A limited number of tuition-and-fee waivers are available to graduate students. They should consult the director of graduate studies in their department for further information. A graduate tuition-and-fee waiver provides exemption from tuition and all incidental fees (except the Hospital-Medical-Surgical Insurance fee) for the academic year. To hold these awards students must be in residence and must register for at least 12 hours per term during the academic year. They may accept part-time or incidental employment not to exceed 20 hours a week either within or without the University.

Veterans who are admissible to a graduate program and who meet certain residence requirements may be eligible for exemption from tuition and certain fees under the Illinois statute covering military scholarships. Further information may be obtained from the Office of Financial Aid, 1312 University Hall.

How to Apply

Application materials and instructions may be obtained from the Graduate College or from any graduate department. Only one application form is needed to apply for any of the types of financial aid listed above.

To insure that an applicant will be considered for all fellowships and other financial assistance programs for the fall quarter beginning in September, the application should be filed with the major department no later than the preceding February 15. Applications for assistantships and tuition-and-fee waivers may be accepted by departments after that date, but students are urged to apply as early as possible, since many departments offer assistantships or recommend tuition-and-fee waivers at the same time they consider applications for fellowships. Consult the director of graduate studies in the department or program for detailed information.

Announcement of Awards

The first group of fellowship awards are announced by the Graduate College on or about April 1. Recipients are expected to accept or decline by April 15. The University of Illinois adheres to the following resolution adopted by the members of the Association of American Universities and a number of other graduate schools in North America:

In every case in which a graduate assistantship, scholarship, or fellowship for the next academic year is offered to an actual or a prospective graduate student, the student, if he indicates his acceptance before April 15, will still have complete freedom to reconsider his acceptance and to accept another fellowship or graduate assistantship. He has committed himself, however, not to resign an appointment after this date unless he is formally released from it.

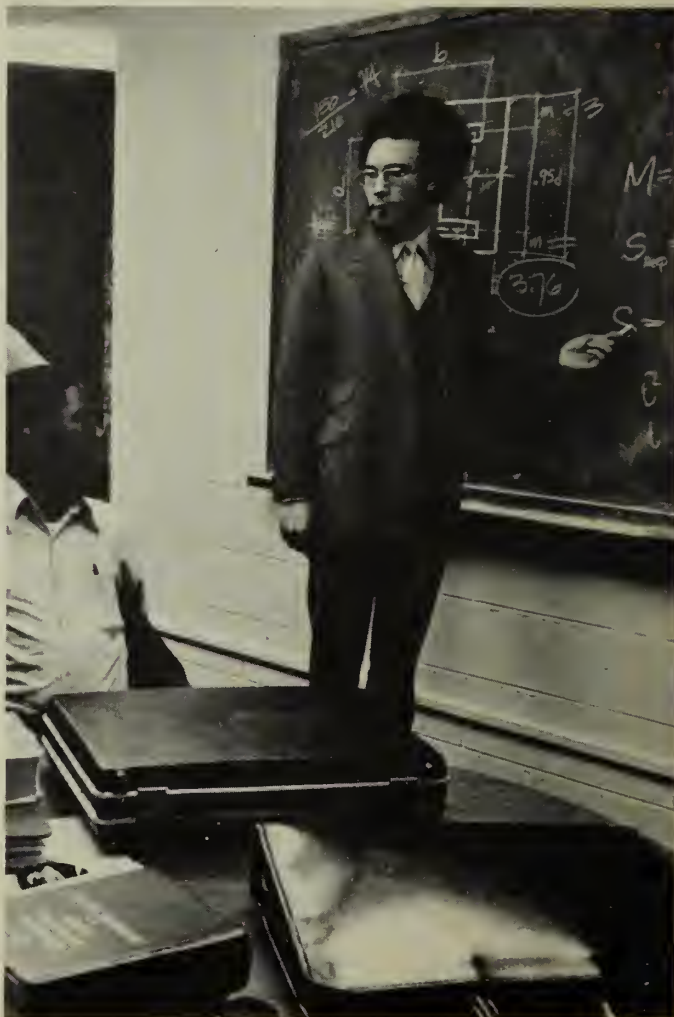
Other Financial Aid

Graduate students can apply for other forms of financial assistance offered through the Office of Financial Aid. These aid sources, described below, include the National Direct Student Loan (NDSL), College Work-Study Program (CWSP), Illinois Guaranteed Loan Program (IGL), Federally Insured Student Loan (FISL), University Long-Term Loans (UTL), emergency loans, veterans benefits, and Illinois Veterans Scholarships.

Further information and applications can be obtained in the Office of Financial Aid, 1308 University Hall.

College Work-Study

The College Work-Study Program is funded by the federal government to help UICC provide additional jobs for students who can prove financial need. To be eligible, students must be enrolled for at least 6 or more credit hours per term. Students enrolled for 8 hours per term may be employed on campus, while students enrolled for between 6 and 8 hours per term may be employed in an approved off-campus agency. For further information and application forms, consult the Office of Financial Aid, 1308 University Hall.



Loans

Several loan programs are available to graduate students.

Long-Term Loans

Long-term loans are based on financial need. The amount that can be borrowed, interest rates, and repayment terms vary. Depending on the program, students may borrow up to \$2,500 a year. The maximum that can be borrowed is \$10,000. Funds are disbursed on a per term basis. Repayment can be spread over a period of five to ten years. Details of the various programs are given below.

National Direct Student Loans (NDSL)

1. Ordinarily an eligible graduate student is limited to \$2,500 per year, to an aggregate of \$10,000, for both undergraduate and graduate years of study. Monies are awarded on the basis of need.

2. The interest rate per year is 3 percent. Repayment and interest do not begin until nine months after graduation or cessation of at least half-time study.

3. You have up to ten years to repay the loan, but a minimum monthly payment of \$30 is required.

4. If you transfer to another school or enter the military service, the Peace Corps, or the Action Corps (formerly VIS-TA), repayment of the loan is deferred (upon request). Deferment of repayment is to be arranged with the University Bursar.

5. Under certain conditions, part of your loan can be cancelled. Specific provisions for cancellation are detailed in the promissory note you sign.

University Long-Term Loans (ULT)

1. Graduates may borrow up to \$7,500 for both undergraduate and graduate years, but no more than \$2,500 per year.

2. A cosigner acceptable to the University's Office of Business Affairs is required. The cosigner must be a United States citizen or legal permanent resident of the United States, must be 21 years of age or older, and must be fully employed.

3. The annual interest rate is 3 percent (6 percent after maturity of note, i.e., the date by which the loan should have been completely repaid).

4. Repayment begins four months after you have left the University.

5. The entire loan must be repaid within seven years, with minimum payments set at \$30 per month.

6. Deferment of repayment because of attendance at another institution of higher education is dependent upon annual verification and written agreement of the note cosigner.

How to Apply for Long-Term Loans and College Work-Study

The National Direct Student Loan, University Long-Term Loan, and College Work-Study are awarded to eligible applicants, based on need. The Office of Financial Aid determines eligibility (with the assistance of the American College Testing Program [ACT] need-analysis service) and, if eligible, puts together for you a "package" of one or more types of campus-based financial aid and notifies you via a computer-printed Award Offer letter.

You must meet the following basic criteria to be eligible for these types of financial assistance:

1. You must be a citizen of the United States or be in the United States for other than a temporary purpose and intend to become a permanent resident (If you are a foreign student,

apply to the Office of Foreign Student-Staff Affairs for financial assistance.)

2. You must be financially needy according to the American College Testing Program (ACT) and the University, both of which use a federally approved need-analysis system.

3. You must be enrolled at least half time (6 hours per quarter, 8 hours per quarter for on-campus employment).

4. You must be making satisfactory progress in the course of study in which you are enrolled in order to retain eligibility.

5. You must not be in default (unless you have made satisfactory arrangements to repay) on a National Direct Student Loan (NDSL), Illinois Guaranteed Loan (IGL), or Federally Insured Student Loan (FISL) borrowed for enrollment at UICC.

6. You must not owe a repayment on a Supplemental Educational Opportunity Grant (SEOG) or a Basic Educational Opportunity Grant (BEOG) at this institution (UICC).

7. You must be a degree candidate

The Office of Financial Aid requires that you file the American College Testing Program (ACT) Family Financial Statement (FFS). (Transfer students may obtain these forms from their college's financial aid office; others, from the UICC Office of Financial Aid.) There is a special Illinois edition of the FFS that includes all the additional questions necessary for UICC. Therefore, students who complete the Illinois FFS need not complete a separate institutional application. Out-of-state students who complete another state's edition of the FFS will be sent an institutional application to complete and return.

After the Office of Financial Aid has received a Comprehensive Financial Aid Report (CFAR), which is the ACT analysis of your FFS, and your completed institutional application (if you did not complete an Illinois version of the FFS), the computer or staff will determine whether additional documents are necessary and request them from you in writing. If no additional information is necessary or once all additional information is submitted by you, your application file is complete.

Students whose application files for financial aid are completed by May 1 will receive primary consideration and will be awarded in need order. Additional dollars, if they exist after awarding the primary consideration group, will be awarded on a first-come, first-served basis to those students who complete their financial aid application files after May 1.

Critical Application Dates. Although it is impossible to specify exactly when you will receive a notification of award, if eligible, the office has provided some critical dates, along with deadlines, to indicate what you may expect, especially if you do not complete your file early.

May 1

Students who have completed financial aid application files in the Office of Financial Aid before May 1 will receive primary consideration for financial aid if they qualify.

August 1

Students who fail to complete their financial aid application files by August 1 should not expect to receive a notification of an award until after the start of fall quarter, assuming that they qualify for aid and additional dollars exist. These students should make alternate arrangements for temporary financial assistance for fall, since they may not receive any dollars until late in the fall quarter or beyond.

September 1

Students who fail to complete their

	financial aid application files by September 1 should not expect to receive a notification of an award, if they qualify, until late in the fall quarter or beyond.
October 1	<i>Fall Quarter Deadline.</i> Students who fail to complete their financial aid application files by October 1 will not be considered for fall quarter assistance. Qualified students will be considered for winter and spring assistance only, assuming dollars are available at this late date.
December 1	<i>Winter Quarter Deadline.</i> Students who fail to complete their financial aid application files by December 1 will not be considered for fall or winter quarter assistance. Qualified students will be considered for aid for spring quarter only.
February 1	<i>Spring Quarter Deadline (Final Deadline).</i> Students who fail to complete their financial aid application files by February 1 will not be considered for spring quarter assistance. In addition, special applications for the summer session will not be considered for these students.
Summer Session	Students wishing summer session assistance must submit a special summer session application in addition to the materials required to complete an application file. Summer session applications from students who failed to complete a financial aid application file by February 1 will not be considered. In addition, summer applications themselves carry their own deadline for submission that will be announced during the preceding winter quarter when the applications become available.

Remember that your file is not complete until all application materials are in the UICC Office of Financial Aid

1. A Comprehensive Financial Aid Report (CFAR), which is the ACT's analysis of your Family Financial Statement (FFS), sent to the University at the same time the Student Financial Aid Report (SFAR) is sent to you.

2. A completed financial aid application (if you did not file the Illinois FFS).

3. An affidavit of parental nonsupport, which is sent to you by the University if necessary.

4. A Financial Aid Transfer Data sheet(s), which is sent to you by the University to send to the colleges that you previously attended.

5. Additional data necessary to clarify or verify the financial information submitted by you or your parents. Requests for additional data, if necessary, will also be sent to you by the University.

As soon as your application is complete, it is then ready to be analyzed. During this phase, your need for financial assistance is determined. If your financial need is not sufficient to award you University/Office of Financial Aid-administered financial assistance, you will be notified in writing at this point. If, on the other hand, you do show need for such financial assistance, your application file then is ready for award packaging.

Federally Insured Student Loans (FISL)

The requirements and provisions of FISL programs are essentially the same throughout the United States. The Illinois Guaranteed Loan Program, described below, is a review model for nonresidents.

Illinois Guaranteed Loans (IGL)

1. Illinois Guaranteed Loans are provided by banks and other lending institutions participating in the program. A list of lenders is available in the Office of Financial Aid.

2. The IGL application is available at many Illinois Banks.

3. The federal government will pay the 7 percent simple interest that accrues on the loan during your enrollment in school, the nine-month grace period, and authorized periods of deferment.

4. You must be a US citizen or a legal permanent resident of the United States and a resident of Illinois. (Any student attending an approved school located within the state of Illinois may be considered a resident of Illinois for the purposes of the Illinois Guaranteed Loan Program.)

5. You must be enrolled at least half time (6 quarter hours per quarter or 4 quarter hours per summer session) in a degree program.

6. Maximum loan amounts: graduate, each year of study, full-time, \$5,000. However, a graduate student may borrow the full \$5,000 as a half-time student, if expenses warrant that amount, once each calendar year or academic year, up to the program maximum.

7. The minimum loan amount is \$150. The student may borrow up to an aggregate of \$15,000 for both undergraduate and graduate work.

8. Payments of not less than \$30 per month must begin nine months after graduation or cessation of at least half-time study. The repayment period is normally five years but can be extended up to ten years.

9. Deferment of repayment is to be arranged with the lender.

Eligibility for Federal Interest Benefits

1. If your adjusted family income is less than \$25,000, you are automatically eligible for Federal Interest Benefits on the amount of the loan.

2. If your adjusted family income is equal to or greater than \$25,000, a need analysis is required on the amount requested to receive Federal Interest Benefits.

3. For any loan request that requires a need analysis, an American College Testing Program (ACT) Family Financial Statement (FFS) is required.

Note: A borrower not eligible for Federal Interest Benefits must make arrangements with the lender to pay the 7 percent interest while enrolled in school.

Short Term Loans

Short-term loans for educational expenses other than tuition and fees can be arranged. The maximum loan is \$100 and must be repaid in 45 days or before the end of the term. There is a service fee of \$1.

Petty cash loans (maximum \$10) are also available. Repayment is by arrangement.

Consult the Office of Student Affairs, 809 University Hall, for details.

Veterans Benefits

The veterans unit in the Office of Student Affairs, 809 University Hall, 996-5141, provides counseling and direct assistance in matters relating to federal and state benefit

programs, employment, housing, tutoring, and financial assistance to veterans and their dependents.

Illinois Veterans Scholarships

The Illinois Veterans Scholarship covers the admissions application fee, tuition, and a small varying portion of the service fee. Qualifying veterans have twelve years of eligibility from the term the application is approved or 120 points, whichever comes first.

Points are allocated as follows: 1-2 quarter hours of enrollment=1 point; 3-4 hours=2 points; 5 hours=3 points; 6-8 hours=4 points; 9-11 hours=6 points; 12+ hours=8 points.

The general qualifications are:

1. You must have completed at least one year of active service in the US armed forces.
2. You must have been discharged under honorable conditions.
3. You must have been a resident of Illinois for at least

six months prior to entering the US armed forces.

4. You must have returned to Illinois within six months after separation from the US armed forces.

Some exceptions to the qualifications may be made. For more specific information and applications, consult the Office of Financial Aid. (Please bring a copy of your DD-214 when you apply.)

Additional Employment Opportunities

The Job Center in the Office of Financial Aid, 1301 University Hall, assists students in finding employment to help defray educational costs. It maintains job listings of part- and full-time openings on the campus as well as in agencies and business firms in the Chicago area. Graduate students are eligible for employment on campus if they are registered for at least 8 quarter hours and do not have a fellowship or an assistantship.



Student Services

The University of Illinois at Chicago Circle provides a wide range of services to its students. The Dean of Student Affairs coordinates the activities and functions of the Associate and Assistant Deans of Student Affairs, the Office of Financial Aid, the Student Counseling Service, Placement Services, the Office of Foreign Student-Staff Affairs, the Health Service, and the Office of Organizations and Activities, as well as various services for students who are veterans or are entitled to veterans benefits. The Dean of Student Affairs is also responsible for monitoring the student discipline system of the University. The health insurance program is administered by the Insurance Office under the director of Business Affairs, and the Chicago Circle Center, parking, food services, lockers, and housing services are under the supervision of the Office of Auxiliary Services.

These services are described below. Additional information will be found in the Student Services Handbook.

Career Placement Services

Career Placement Services assists graduate students in career planning, determining objectives, and finding permanent employment. The staff provides an on-campus interviewing program, lists current employment opportunities, maintains directories and lists of prospective employers, and assists students in the preparation of career resumes. Further information can be obtained in 106 Roosevelt Road Building.

Chicago Circle Center

The Chicago Circle Center (CCC) is a building devoted to student services and student programs. Major service areas include the University Bookstore, Food Service, the Parking Office, CCC Pharmacy, the Photo-ID Office, and the Main Desk. Special interest areas include a map room, recreation area, organization meeting rooms, a travel agency, a barbershop, the Craft Workshop, an art gallery, a study lounge, and a music listening lounge.

The Program Department presents a variety of programs for students including concerts, discos, films and speakers. The Recreation Department regularly sponsors tournaments, trips, and clubs. Each term, CCC offers special workshops designed to stimulate creative instincts and develop skills. The great variety of courses include dance, ceramics, macrame, vehicle repair, yoga, and bartending. cultural and entertaining programs ranging from concerts and poetry readings to film series and well-known speakers.

Recreation facilities include swimming pool, handball, bowling, weight lifting, and billiards.

Bookstore supply areas and food service facilities are also located in the Behavioral Sciences Building and in Science and Engineering South.

Circle Children's Center

A full-time day care facility is available to the children of

students, faculty, and staff. Children must be between the ages of 3 and 6 and toilet trained. Rates are on a sliding scale based on family income. The center serves as the research site for a preschool curriculum based on the theory of Jean Piaget, the Swiss psychologist. Call 996-8664 or 8663 for additional information and application forms.

Communicator

Call the Communicator, 996-5500, at any hour for announcements of events, holiday schedules, emergency bulletins, and other important information. To place an announcement, call 996-5055.

Financial Aid

For detailed information on fellowships, scholarships, tuition waivers, assistantships, and other forms of assistance specifically reserved for graduate students, refer to the chapter *Fellowships, Assistantships, and Financial Aid*. The chapter also presents information about National Direct Student Loans, University Long-Term Loans, Federally Insured Student Loans, the Illinois Guaranteed Loan Program, short-term emergency loans, the Work-Study Program, and student employment.

Food Services

The Chicago Circle Center provides full cafeteria service for breakfast and lunch in the Main Cafeteria on the first floor. The Pier Room on the second floor offers breakfast, fountain, short-order, and vending services. Dinner service is available for Program PM students, faculty, and staff. The Cardinal Room on the third floor offers full lunch service. Food service is also available on the first floor of the Behavioral Sciences Building and on the ground floor of Science and Engineering South. Vending services are located in buildings throughout the campus.

Foreign Student-Staff Affairs

The Office of Foreign Student-Staff Affairs is located on the eighth floor of University Hall. It serves both foreign- and native-born students interested in international educational exchange programs and opportunities. The staff provides evaluations of proficiency in written and spoken English, guidance in career planning, counseling on personal problems (financial, scholastic, and social), and information on cross-cultural activities and programs. In addition, the office provides documents and endorsements for extensions of non-immigrant visas and information about employment opportunities on and off campus, travel outside the United States, certification of attendance, and foreign army deferments. The staff also has information on the application of immigration regulations to students and faculty members who are citizens of foreign countries.



Health and Personal Accident Insurance

The Insurance Office (1219 University Hall) administers the Chicago Circle Hospital-Medical- Surgical Insurance program. A student who does not provide evidence of personal health insurance coverage within the first 10 days of instruction of the respective term will automatically be enrolled in the plan provided by the University. The precise details of the coverage and benefits are set out in the insurance brochure available in the Insurance Office. The program is designed to protect students from the financial hardship that might be incurred by illness or accident. See *Tuition, Fees, and Other Charges*.

Health Service

The Health Service, a fully staffed medical and mental health unit located on the eleventh floor of University Hall, offers on an out-patient basis a wide range of services that include preventive measures and comprehensive medical and mental examinations and evaluations with treatment. Complete laboratory and X-ray facilities are available.

Health Service expenses are covered by the obligatory student health fee, paid each term by every student. Health Service hours are 8-5, Monday-Friday. At other hours, patients are referred to the emergency room of the University of Illinois Hospital at the Medical Center.

Housing Services

A wide range of housing services is offered to graduate students. Every effort is made to assist those wishing to share their accommodations and those seeking such an arrangement. The Housing Office also cooperates with off-campus organizations specializing in locating roommates.

Listings of privately owned housing, including furnished and unfurnished apartments, houses for rent or for sale, and rooms for rent, are available for inspection in this office, and listings are posted on the Auxiliary Services bulletin board on the first floor near the main entrance of Chicago Circle Center. Persons listing housing accommodations have signed a pledge not to discriminate on the basis of race, religion, or national origin. For information call or write:

Office of Auxiliary Services
Housing Office
Box 4348, Chicago, Illinois 60680
Telephone (312) 996-5055 or 5058

Lockers

Any student or faculty member may claim and attach a lock to any unoccupied locker (available in most classroom buildings) during the academic year. Contents and lock must be removed not later than the end of the summer session of each year, when any remaining locks and locker contents will be disposed of. The University is not responsible for contents, theft, or loss. For assistance or information, call Auxiliary Services, 704 Chicago Circle Center, 996-5058.

Organizations and Activities

The Office of Organizations and Activities advises more than 190 registered student organizations. It provides assistance in registering organizations and in establishing their structure, financial operations, space reservations, event planning, record keeping, and publicity. Further information can be obtained in 712 Chicago Circle Center.

Parking

Parking facilities for students, faculty, staff, and guests of the University are of two types: key-card lots with a fee for the term and coin-operated daily fee lots with attendants during peak hours.

Parking fees are subject to periodic review and change. Consult the University Parking Office at 996-5053 or 704 Chicago Circle Center for further information.

Photo Identification Cards

All students at UICC must have a *permanent* UICC color photo ID card in order to borrow University library books, to establish charge accounts at the University Bookstore, to obtain prescription drugs at the CCC Pharmacy, or to cash personal checks at the Chicago Circle Center cashier. The ID Card Office, 704 Chicago Circle Center, is open 9-12 and 1-4 p.m. during the first two weeks of each term. The remainder of each term it resumes regular hours of operation, 10 a.m.-2 p.m., Monday-Friday. Students need current fee receipt and proof of age to obtain a photo ID. The original ID card is free. For further information, call 996-5353.

Student Counseling Service

By providing personal counseling, specialized group

services, career planning, and psychological testing, as well as special services for the disabled student, the Student Counseling Service aims to foster the educational, vocational, and personal development of the student so that maximum benefits may be obtained from the educational experience. Students are encouraged to make use of these services by making an appointment in 1007 University Hall when the need arises.

Personal counseling, including marital counseling, is offered on either an individual or a group basis to any student who seeks help in working through personal concerns and problems and in developing a positive, realistic self-image. Educational and vocational counseling are available to students who wish to develop and assess their plans. Individual testing is offered in support of counseling. Group services include the following noncredit classes: reading, vocabulary, study skills, assertiveness training, shyness clinic, and relaxation training. A thesis and dissertation workshop is offered each term to provide assistance with motivational difficulties arising at any stage in the thesis task.

The Speech and Hearing Clinic provides facilities for hearing testing, diagnostic speech and voice evaluations, and correction of speech problems. Students who wish assistance in correcting speech difficulties, including those arising from foreign accents, hearing impairments, and voice or articulation problems, should avail themselves of the services of the clinic, 202 Grant Hall.

The Test Scoring Service offers faculty members, as well as teaching and research assistants, the facilities for rapid scoring of tests and analyzing test items. Interested persons should make an appointment for consultation in 1007 University Hall.

All students with disabilities are invited to consult the coordinator of services to the disabled, 1007 University Hall, for special services or information.

Travel office

A full service travel office is located in 200C Chicago Circle Center, 996-4488. The travel office handles University-related travel as well as reservations for air, train, and other travel services for individuals and groups.

Veterans Affairs

Veterans with questions on admission or readmission, graduation requirements, academic progress, disciplinary regulations, fee payments, or other essential information should review the appropriate sections of this catalog (see the Table of Contents), as well as in the section for the particular department in which the veteran is enrolled.

The Office of Student Affairs provides certification services to veterans enabling receipt of educational assistance benefits under the GI Bill. In addition, a federal Veterans Administration representative is available to assist veterans in direct liaison with the Veterans Administration concerning any problems a veteran may have. The office is located in 809 University Hall, 996-5141. The Student Disciplinary Code and policies affecting student organizations and activities are printed in such other official publications as the Student Services Handbook and the *UICC Journal*.



Admission

The academic year at Chicago Circle consists of three eleven-week quarters (including the final examination periods) that begin in September (fall quarter), January (winter quarter), and March (spring quarter). The eight-week summer session begins in June. Some colleges and departments offer courses, institutes, and other programs during the summer.

In most programs, a student may seek admission to any one of the four terms; however, the scheduling in many programs, especially in the professional colleges and schools, makes it desirable that students enter in the fall quarter.

Applicants are considered on an individual basis. They must meet the minimum requirements for admission to the Graduate College as well as the requirements of the particular department or program in which they wish to study. Prospective students should consult the appropriate sections of this bulletin for specific admission requirements.

The policy of the University of Illinois is to comply fully with applicable federal and state nondiscrimination and equal opportunity laws, orders, and regulations. The University of Illinois will not discriminate in its programs and activities against any person because of race, color, national origin, ancestry, religion, age, sex, handicap, or status as disabled veteran or veteran of the Vietnam era. This non-discrimination policy applies to admissions, access to, treatment, and employment in the University programs and activities. Vice President Ronald W. Brady has been designated as the University equal opportunity officer for the University of Illinois. For additional information on the equal opportunity and affirmative action policies of the University, please consult Richard M. Johnson, Vice Chancellor for Academic Affairs, or Richard H. Ward, Vice Chancellor for Administration.

Graduate College Requirements

The minimum requirements for degree admission are:

1. Except for seniors at the University of Illinois at Chicago Circle (see 5 below), a baccalaureate or its equivalent from an accredited college or university. Seniors at UICC must be within 8 quarter hours of the baccalaureate at the beginning of the term for which admission is sought. See *Graduate Study by Seniors at the University of Illinois at Chicago Circle*.

2. A cumulative grade point average of at least 3.75 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. The grade point average is computed on all of the work taken in the quarter or semester in which the student began the final 90 quarter hours of undergraduate study. The cumulative grade point average obtained in all work completed beyond the baccalaureate may also be computed and considered.

3. Transcripts from those institutions where the student earned degrees (bachelor's and master's) and transcripts from all other colleges and universities attended within the last eight years. If the degrees were earned more than eight but less than fifteen years prior to the quarter for which admission is sought, only transcripts from those institutions

where the student earned the degree(s) are required. If the prospective student has not been enrolled in a college or university for more than fifteen years prior to the quarter for which application is made, only proof of the degree(s) held is required.

4. Recommendation for admission by the department or program to which application is made and by the Dean of the Graduate College.

5. Senior standing at the University of Illinois at Chicago Circle. At the time of admission, the student must be within 8 quarter hours of the baccalaureate. (See *Graduate Study by Seniors at the University of Illinois at Chicago Circle*.)

These are minimum Graduate College requirements. Departments or units may have additional requirements. Most departments and programs require grade point averages higher than the minimum listed; many require complete transcripts from degree applicants; many require Graduate Record Examination scores, letters of recommendation, undergraduate training in designated courses or fields, statements of the applicant's career goals, or other information. Prospective students should consult appropriate sections of this catalog for specific requirements.

Nondegree Students

Students who will benefit from specific aspects of graduate study may be admitted on nondegree status. For details, see *Admission Status*.

Admission Status

Applicants are admitted to degree or nondegree status. Degree candidates are classified in:

- A. Regular (Full) Status.
- B. Limited Status. This is a probationary status for students who:

1. Have less than a 3.50 undergraduate grade point average;
2. Have specified deficiencies to be removed;
3. Present foreign credentials that must be evaluated at the time of registration; or
4. Are within 8 quarter hours of earning the baccalaureate. (See *Graduate College Requirements and Graduate Study by Seniors at the University of Illinois at Chicago Circle*.)

Permits for status B1, B2, and B3 are issued with the understanding that the major department will determine deficiencies or prerequisites and will advise the student on a program of study.

A student may be admitted on limited status for a maximum of four terms in residence or 24 quarter hours, whichever occurs earlier. The department shall specify the conditions for admission to full status in writing to the student and the Graduate College, preferably at the time of admission but not later than the end of the first term in residence. If the conditions are not met within the foregoing

limits, the Graduate College will initiate drop action.

C. Nondegree status is designed for three types of applicants who hold the baccalaureate.

1. Individuals who do not wish to pursue a degree but desire to take courses for professional or scholarly reasons or personal enrichment.

2. Individuals who have been out of school for several years and wish to take a few courses before deciding whether to apply for a degree program or those who are changing their fields of study.

Applicants in categories 1 and 2 must submit an application and proof that they hold a baccalaureate from an institution of recognized accreditation. Some graduate units will require more credentials (check the appropriate section in Departments and Programs). In order to learn whether specific courses are open to nondegree students, applicants are urged to contact the director of graduate study in the appropriate graduate unit before submitting an application. Approval of the appropriate unit is required for all applications for nondegree admission.

Foreign students who require certification of admission (I20) to the Immigration and Naturalization Service will not be admitted as nondegree students.

If a nondegree student later desires to become a candidate for a degree, all credential requirements for regular admission must be submitted for consideration by the appropriate unit. If the student is admitted to a degree program, a maximum of three graduate level courses in which grades of A or B were earned may be transferred by petition to degree credit. Consequently, an early decision to apply for regular admission is urged.

Admission to nondegree status does not obligate the Graduate College or any unit to admit a student to a degree program.

3. Individuals who apply for intercampus programs leading to a degree granted by another campus of the University. Applicants in this group must submit complete credentials as specified by the Graduate College and unit in which the applicant plans to study.

Admission as a Visitor (Auditor)

The privilege of attending classes as a visitor is granted on and after the first day of instruction by the instructor of the class with the approval of the Dean of the Graduate College and payment of a visitor fee. Registration forms may be obtained from the Graduate College, 1523 University Hall, or the Office of Admissions and Records, 1-120 Library.

Visitors are not permitted in laboratory, military, or physical education classes.

A registered student on a full-fee schedule or a permanent nonacademic employee of the University does not pay the visitor fee. (See *Fees*.)

Application Procedures

An application for admission is included in the front of this catalog. Applications are also available from the Office of Admissions and Records, the departments and programs, or the Graduate College. Prospective students should apply for admission at least two months before the beginning of the term in which they wish to enroll. The number of graduate students who can be admitted is limited and applications are processed in the order in which they are received. Admission consideration ceases when enrollment capacities are reached; therefore, applications and supporting credentials should be submitted as early as possible.

Applications must be accompanied by the nonrefundable application fee of \$20.

Applicants are reminded that most departments and programs require Graduate Record Examination test scores, letters of recommendation, statements of career goals, and other supporting credentials. These materials should be sent directly to the department director of graduate studies. Final admission recommendations cannot be made until all required documents have been received by the department or program to which admission is sought. Applicants should also be sure to request the registrar of each college or university they have attended to send an official transcript of their records directly to the Office of Admissions and Records.

Foreign Applicants

Persons who have completed their studies outside the United States must present all post-secondary school credentials. Such credentials must include a record of all studies completed to date, grades or examination results received (including failing as well as passing grades), maximum and minimum grades obtainable, rank in class, degrees, diplomas, and certificates earned, and length of the school year. Documents must be authentic or certified, and those not written in English must be accompanied by certified English translations.

An applicant whose native language is not English is required to take the Test of English as a Foreign Language (administered by the Educational Testing Service, Box 899, Princeton, New Jersey 08540). A minimum score of 480 is required on the TOEFL for admission to the University. Some departments require a higher score. The TOEFL is given at regularly scheduled intervals at testing centers throughout the world. Information on testing dates, locations, and the testing fee may be obtained at American embassies and consulate offices of the US Information Service, Binational Educational Commission, or the US Educational Foundation. In exceptional cases, foreign applicants who are already in the United States may be admitted to the Graduate College on limited status without having taken the test. They will be required to take the test on their arrival in Chicago and before being permitted to register for courses. In cases of clearly demonstrated knowledge of the English language, the test may be waived. The TOEFL examination is not necessary for students who have completed at least two academic years of study in a country where English is the native language and in a school where English is the language of instruction within five years of the proposed date of enrollment in the University.

The Tutorium in Intensive English is designed for international students who wish to learn or to improve their command of the English language. The full-time course of study is a *noncredit* program that meets twenty hours a week in the evening during the ten-week term. Part-time programs are also available. Completion of this course does not waive the Test of English as a Foreign Language. For additional information, write the Department of Linguistics, University of Illinois at Chicago Circle, Box 4348, Chicago, IL 60680, (312) 996-5334.

Several English language courses for foreign students are available at Chicago Circle (English as a Second Language 110, 120, 130). Because these courses are designed to increase English competency, foreign students are urged to enroll in them.

Foreign students granted admission receive from the Office of Admissions and Records all appropriate documents, including the certification forms that are required when applying for visas to enter the United States.

Financial Arrangements

Foreign students must be able to finance themselves fully, including room and board, tuition, books, other expenses,



and travel to and from the United States. All applicants who plan to finance the cost of attending the University of Illinois from personal resources must certify that they will have available approximately \$6,300 per year. The appropriate certification form can be obtained from the Office of Admissions and Records. Applicants who are unable to provide satisfactory evidence of adequate finances or who have not sent a notarized certified statement verifying funds available and their source will not be granted admission.

Graduate foreign students may apply for fellowships, assistantships, long-term loans (US cosigner required), and tuition waivers and will be in equal competition with United States applicants. These financial aids are awarded on the basis of outstanding scholarship and the potential to undertake research. For further information and financial aid application forms, prospective students should write directly to the director of graduate studies of the department in which they propose to study or to the Graduate College, University of Illinois at Chicago Circle, Box 4348, Chicago, Illinois 60680.

Graduate Study by Seniors at the University of Illinois at Chicago Circle

With the approval of the department, the undergraduate college, and the Graduate College, seniors at the University of Illinois at Chicago Circle may be admitted to the Graduate College if they are within 8 quarter hours of earning the baccalaureate. They will be admitted on limited status for a maximum of four terms in residence or 24 quarter hours (whichever occurs earlier), pending completion of the baccalaureate. Courses used to fulfill undergraduate degree requirements may not be applied toward a graduate degree.

Inter-campus Graduate Programs

Several departments have developed inter-campus programs by which Chicago Circle students can participate in degree programs offered by departments or units at the Urbana-Champaign or the Medical Center campus of the University of Illinois. Students whose applications to an inter-campus program are accepted will be able to fulfill all or most degree requirements by taking courses at Chicago Circle; they will register at the degree-awarding campus for independent study, special topics, or thesis research as required by the program, meet the requirements of the degree-awarding department or unit, and have members from the degree-awarding department or unit on their examining committees. In the case of the Bioengineering Program, students take courses at both the Medical Center and Chicago Circle. They register for thesis research at the campus from which they propose to receive their degree. See *Graduate Units at Chicago Circle* for a list of inter-campus programs and the department directors of graduate studies for further details.

Traveling Scholar Program

This program enables doctoral-level students to take advantage of educational opportunities—specialized courses, unique library collections, unusual laboratories—at any of the other Big Ten universities or the University of Chicago. The student registers and pays fees at Chicago Circle. The program is sponsored by the Committee on Institutional Cooperation (CIC). For further information, consult the department director of graduate studies or the Graduate College.

Academic and General Regulations

Students should familiarize themselves with the academic requirements of the Graduate College and of the department or program in which they are working. They are responsible for complying with these regulations and for fulfilling all the degree requirements. Every graduate student should have a copy of the Graduate College bulletin, Graduate Study 1979-80, the official statement of policy. The procedures and requirements of the Graduate College are stated in this catalog. Every graduate student should also have a department graduate student handbook, if issued.

Advisers

Each graduate student must have an adviser in the department or program in which degree work is to be done. The adviser assists in planning a program of graduate study that fits the needs of the student and satisfies department or program and Graduate College requirements. A new student should consult the director of graduate studies to discuss the selection of an adviser.

Petitions

A student may petition the Dean of the Graduate College for exceptions to any of the following regulations but should do so only after consulting with the adviser and the director of graduate studies. Their recommendations must appear on the petition. Petition forms may be obtained from the Graduate College and from department or program offices.

Registration Requirement

Students who interrupt their enrollment (with the exception of summer session) and who have not received approval for an off-quarter vacation, for a leave of absence, or for the special registration option available only to certain PhD candidates lose their status as graduate students. If they wish to return, a new application must be made for readmission. The requirements for a degree are those in the Chicago Circle bulletin, Graduate Study, at the time of readmission or any subsequent bulletin, provided that all requirements of one bulletin are met.

Leave for Graduate Students

A graduate student in good standing in a degree program may be granted a leave of absence for up to one calendar year plus a summer session upon the recommendation of the major department and approval of the Graduate College. A request for leave must be submitted prior to the period of leave. Students who are on approved leave of absence will not be covered by the health and personal accident insurance plan until they return to campus.

Although a student on leave of absence status need not apply for readmission, the Office of Admissions and Records must be notified in writing at least one month before the beginning of the term (whether prior to or at the conclusion of

the approved leave) for which the student will register so that registration materials may be prepared. Time spent on leave of absence status will be included in calculating time limits for advanced degrees, but the circumstances necessitating the leave will be considered if an extension of time should be requested.

Leave will not be granted to doctoral candidates who have passed the preliminary exam. Leaves of absence are not required for participants in the CIC Traveling Scholar Program.

Petitions for leaves of absence may be obtained from the Graduate College, 1523 University Hall, or from the director of graduate studies in the concerned graduate unit.

Doctoral students who have completed all requirements for the degree with the exception of the dissertation are not eligible for leaves of absence. (See Registration Requirement under Doctoral Degree).

Credit

Graduate College credit is not given for courses in which the student was an auditor or received a grade of E, F, or U.

Department or Program credit is usually granted only if the student received a grade higher than the minimum passing grade. Students should consult the department listings for details.

Repetition of Courses. A student is permitted to repeat a course for credit if it is (1) designated in the Timetable with the phrase "May be repeated for credit"; (2) a course in which a failing grade was received. In the latter case, the course may be repeated only once and may be counted once toward the degree requirements; the original grade continues to be included in the computation of the grade point average. The approval of both the instructor who will give the course and the director of graduate studies is required; (3) a course in which a student received an In. If the In has not been removed by the deadline (see *Grades*), the course may be repeated for credit only once.

Course Loads

Students who can devote full time to their studies usually enroll for 12 to 16 quarter hours in the fall, winter, and spring quarters and 8 quarter hours in the summer session. In exceptional cases, the adviser and director of graduate studies may permit a student to enroll for 17 to 20 hours (12 hours in the summer session). A student holding a half-time assistantship, or one employed outside the University for an equivalent amount of time, is advised to enroll for not more than 12 hours.

Fellowship Holders. Fellowships are awarded to superior students, who are required to carry a minimum of 12 quarter hours of credit.

Tuition-and-Fee Waiver Holders. Students awarded special Graduate College tuition-and-fee waivers must carry a minimum of 12 quarter hours of credit.

Minimum Full-Time Study.

A. *Foreign Students.* For purposes of enrollment certification to the Immigration and Naturalization Service of the United States Department of Justice, the Graduate College considers foreign students to be pursuing a minimum full-time program of study if they: (1) enroll for 12 or more quarter hours of credit or (2) hold an appointment as a teaching or research assistant for: (a) one-half time and enroll for at least 8 hours of credit or (b) one-third time and enroll for at least 10 hours of credit.

B. *Veterans.* To be eligible for full benefits, a veteran must be registered for at least 12 quarter hours of credit (8 quarter hours in the summer session).

Off-Quarter Vacation

Students may elect to attend any three terms in one calendar year. If they choose to use a term other than the summer as the vacation or Off-Quarter, they must file an application for Off-Quarter Vacation with the Office of Admissions and Records before the first day of instruction of the term they wish to use as Off-Quarter Vacation. Application blanks are available in that office. If the vacation term is other than the summer session, students must attend the summer session of that calendar year if they wish to retain their status as a continuing student.

Students approved for an Off-Quarter Vacation are entitled to the same privileges as continuing students. If they wish to advance enroll, they must present written notice to the Office of Admissions and Records prior to the time for mailing advance enrollment materials to continuing students. Advance enrollment materials are prepared and mailed during the sixth week of the term. They may make arrangements with the Insurance Office to continue their Hospital-Medical-Surgical Insurance during the Off-Quarter Vacation.

Courses of Instruction

Courses open to graduate students are of two types. Those numbered 300-399 are open to advanced undergraduate and graduate students. Those numbered 400-499 are generally open only to graduate students. Some 300- and 400-level courses are available for graduate credit in departments other than those offering advanced degrees. Students should consult their advisers about the possibility of using these courses in their plans of study.

A number of courses carry variable credit. At the 300 level, additional work, such as special reports, papers, or projects, is required of a student who registers for the maximum credit allowed. At the 400 level, some research, reading, and independent study courses provide variable credit; the proportion of time devoted to a particular course can thus be indicated on the student's record.

The number 499 is used exclusively to designate thesis research.

Prerequisites

Exceptions to prerequisites listed in course descriptions in this catalog may be granted only with the consent of the instructor and under special circumstances.

Program Changes

A student may not add a course after the tenth day of instruction in a quarter or the sixth day of instruction in the summer session. A student has the option of dropping a course until the end of the sixth week of the quarter or the fifth week of the summer session. Thereafter a course may not be dropped. Holders of fellowships, tuition-and-fee waivers,



and student visas must maintain the required number of credit hours.

Visitor Privileges

A graduate student regularly registered at one of the campuses of the University of Illinois may be permitted to attend classes as an auditor (without credit) at the discretion of the instructor. Students who wish to have their audited courses recorded on their transcript must pay the Course-Visitor-Auditor Fee (see *Tuition, Fees, and Other Charges*) if they are not registered in Range I (12 or more quarter hours).

A student should not enter on the program registration card any courses to be attended as an auditor.

Visitors not registered at Chicago Circle are permitted to attend classes other than laboratory courses. Visitors must file with the Office of Admissions and Records a permission form bearing the approval of the instructor and the Dean of the Graduate College and pay the Course-Visitor-Auditor Fee (see *Tuition, Fees, and Other Charges*).

Grades

The following grades are used:

A—5 grade points per credit hour.

B—4 grade points per credit hour

C—3 grade points per credit hour.

D—2 grade points per credit hour (lowest passing grade).

E—1 grade point per credit hour (failing grade).

Df—Grade temporarily deferred. Deferred grades may be used only for thesis courses and continuing seminar and sequential courses. At the end of a continuing course sequence the deferred grade for all terms must be converted either to a specific letter grade (A-E), to an In (Incomplete), or to an S or U in thesis research courses or specifically approved courses.

In—Incomplete. An incomplete grade may be given only if, for reasons beyond the student's control, required work has not been completed by the end of the term. An In must be removed by the end of the student's second term in residence subsequent to that in which it was received or, if the student is not in residence, by the end of the twelve consecutive months subsequent to that in which the In was received. An In that is not removed by the deadline will remain on the record as an In. A course in which an In was received and not removed by the deadline may be repeated for credit only once.

P—Pass; F—Fail. Used only in courses taken under the pass-fail grading option. No grade points are earned and the grade is not computed in the grade point average. If the required work for the course has not been completed by the end of the term, at the instructor's discretion an In (Incomplete) may be given. A graduate student may take courses on a pass-fail basis provided that:

1. The courses are not within the student's immediate area of specialization.

2. Such courses account for no more than one-sixth of the total number of course hours taken at the University of Illinois at Chicago Circle and counted toward a degree.

3. The student declares the intention to take a course on this basis at the time of registration.

S—Satisfactory; U—Unsatisfactory. To be used as the final grade only in thesis research courses, in zero-credit courses, and in specifically approved courses. No grade points are earned and the grade is not computed in the cumulative average. In the case of specifically approved courses, if the required work has not been completed by the end of the term, at the instructor's discretion an In (Incomplete) may be given. W—Officially withdrawn from the course without penalty.

Continuation and Probation Rules

Minimum Criteria of the Graduate College

Students may continue to register as long as they remain in good standing, defined as satisfactory academic progress.

The minimum Graduate College academic criterion is that a student must maintain a cumulative grade point average of at least 4.00 on all work taken at UICC as a graduate student. Two separate averages are computed: (a) on all courses (100-400 level) and (b) on graduate courses alone (300-400 level). A minimum of 4.00 is required in each computation. *Transfer and extension credit is not computed in the cumulative grade point average, unless such credit was earned in courses offered by UICC.*

1. If during two successive terms in residence the cumulative grade point average is below 4.00 as defined above, the student is placed on probationary status. This warns students that, if their academic record continues to be unsatisfactory, they will not be permitted to register.

2. After three consecutive terms in residence with a cumulative grade point average below 4.00 as defined above, the student will not be eligible for further registration.

In exceptional cases, and on department recommendation, the Graduate College may permit a student to continue to register for one additional quarter. A petition is required.

The Graduate College issues probation and ineligibility-for-registration notices.

Department Standards

Departments and programs may require a higher level of performance and may apply criteria in addition to those stated above. For example, a student who accumulates an excessive number of incomplete grades may not be permitted to register until the courses have been completed or may be required to register for a lighter course load until the incomplete grades have been converted to letter grades.

Each department or program has a graduate advisory committee that regularly reviews the student's performance and progress. If it is dissatisfied with a student's record, it issues a warning to the student and sends a copy to the Graduate College. If, after at least one term, a second review indicates continued dissatisfaction with the student's performance and progress, the student and Graduate College are informed and the latter issues an ineligibility-to-register notice. The advisory committee may also terminate a student for failure or repeated failure in a major or comprehensive examination. In such cases the warning procedure may be omitted.

Transfer of Credit

Transfer of Advanced Degree Credit. Unless the department or program specifies otherwise at the time of admission, a doctoral candidate who has received a master's

degree or its equivalent will receive 48 hours of credit toward the minimum 144 quarter-hour requirement for the doctoral degree. A petition is not required.

Transfer of Course Credit. Consideration is given to the transfer of graduate work completed in accredited institutions. Such institutions are either those approved by one of the regional accreditation associations or those approved by some of the agencies recognized by the Council on Post-Secondary Education. The number of credit hours that may be transferred is determined on an individual basis. No transfer is automatic. Only graduate work that meets at least the quality and content of courses offered at the University of Illinois at Chicago Circle is considered for transfer. No more than 50 percent of the total hours required for the degree and only credits in which the student received a grade of A or B (or the equivalent) may be transferred. Six quarter hours are the equivalent of four semester hours.

Credit earned more than six calendar years before admission to the Graduate College is not transferred. Individuals enrolled as non-degree students who subsequently are admitted as degree candidates may, by petition transfer a maximum of three graduate level courses in which grades of A or B were earned. For probation and graduation purposes, transfer credit is not computed in the cumulative grade point average unless such credit was earned in courses offered by UICC. Consideration is given to the transfer of credit in three categories:

a. Graduate work for which a degree was not awarded.

b. Graduate work completed elsewhere after admission to Chicago Circle and for which a degree was not awarded. Students considering taking graduate work elsewhere during a Leave of Absence or Off-Quarter Vacation should consult their adviser and director of graduate studies about such plans and the courses that may be considered for transfer.

c. Graduate work completed in the senior year at Chicago Circle that was not applied to the baccalaureate.

Procedures

A petition is required and should not be submitted until the student has completed at least 12 quarter hours of graduate work at Chicago Circle. The department or program evaluates the student's petition and makes its transfer recommendations to the Graduate College. The petition must show the course(s) recommended for transfer by the department or program and the number of quarter hours of credit recommended. A transcript showing grades and a certification from the registrar or college dean of the applicable institution stating that the courses are graduate level and were not used toward fulfillment of the requirements for a degree is necessary.

Regulations Pertaining to Degrees

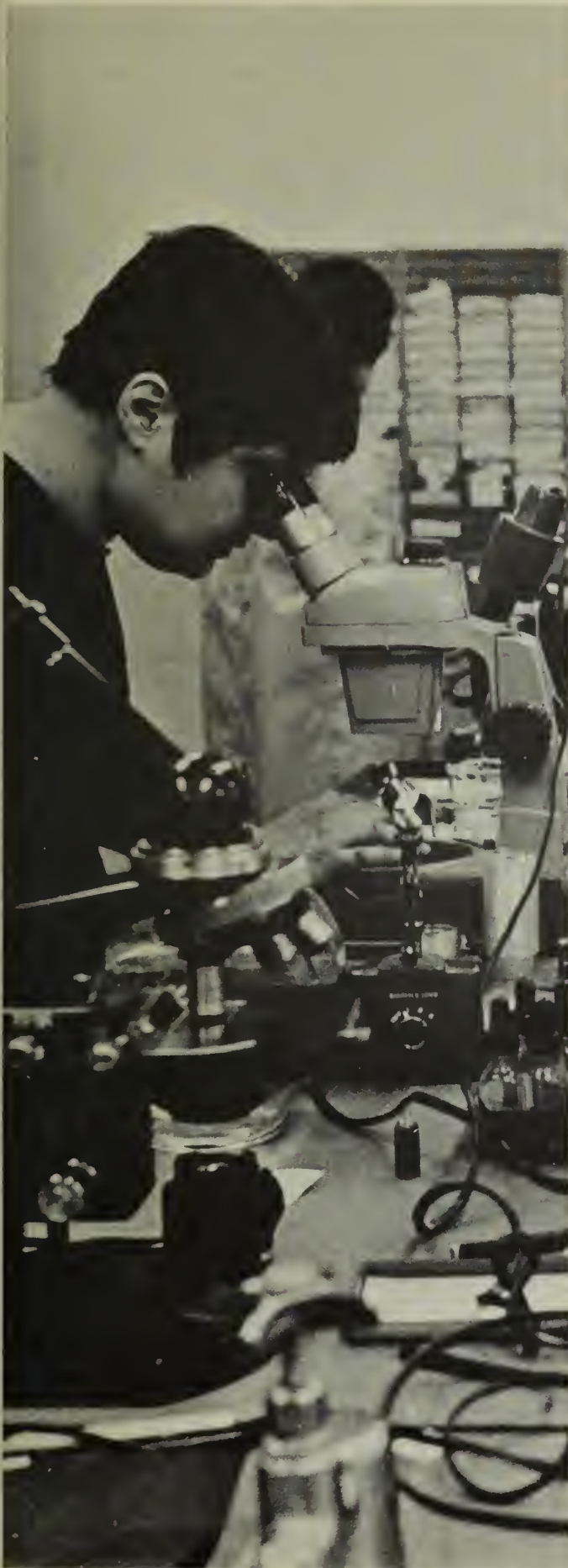
All Graduate Degrees

Grade Point Average. A cumulative grade point average of at least 4.00 is mandatory. For the method of computing the average, see *Continuation and Probation Rules*.

Foreign Language Requirement. A foreign language requirement is left to the individual department or program, subject to the approval of the Graduate College.

Areas of Specialization. Every student must select a major area of specialization consisting of courses closely related to each other, not all of which are necessarily offered by the major department. Students should consult their director of graduate studies for details.

A minor area of specialization consists of a group of course offerings that have a distinct relationship, though they may be offered in more than one department. If a student



elects, or is required by department regulations to declare, a minor area outside the major department, the courses chosen must be approved by the adviser and director of graduate studies.

Note: The following general requirements for the individual degrees are the minimum standards of the Graduate College. Students should consult the detailed department and program listings for a full statement of particular requirements. It is the student's responsibility to be aware of all regulations and requirements and to satisfy them as early as possible.

Master's Degree

Residence. One-half or 50 percent of the minimum number of quarter hours of graduate work required for the degree, including not more than 25 percent of the hours in courses titled Independent Study or Thesis Research, must be earned at the University of Illinois at Chicago Circle. Courses taken through University Extension do not qualify for residence credit.

Credit Hours. At least: 48 quarter hours beyond the baccalaureate; 16 quarter hours at the 400-level, of which at least 8 must be in regularly scheduled courses (excluding independent study courses and thesis research); 24 quarter hours in the major area of specialization, including 12 hours at the 400 level. Not more than 18 quarter hours in Thesis Research in a 48-quarter-hour program.

Thesis. Thesis students must register for a minimum of 8 hours in thesis research. Credit will be applied only after the thesis is accepted. Specific instructions on the format of the thesis are contained in the leaflet, "Instructions for Preparation of Theses," available in the Graduate College office, 1523 University Hall.

Examinations. If an examination is required, its structure is determined by the department. If a master's thesis is presented, the candidate defends it before a committee appointed by the Dean of the Graduate College on the recommendation of the department. This committee consists of at least three persons, at least one of whom must be a member of the Graduate Faculty. One member of the committee may be from outside the department or from outside the University. The approval of the thesis by a majority of the committee is required.

Time Limitation. In programs requiring 48 to 60 quarter hours of graduate work, candidates must complete all of the requirements within four calendar years after their initial registration in the Graduate College; in programs requiring 61 to 96 quarter hours of graduate work, candidates must complete all of the requirements within six calendar years; and in programs requiring more than 96 quarter hours of graduate work, candidates must complete all of the requirements within eight calendar years.

Doctoral Degree

Residence. At least 48 quarter hours beyond the master's level or its equivalent must be taken at the University of Illinois at Chicago Circle. Courses taken through University Extension do not qualify for residence credit.

Credit Hours. At least 144 quarter hours beyond the bachelor's degree must be obtained for the doctoral degree.

Thesis. The candidate for a doctoral degree must demonstrate capacity for independent research by the presentation of an original thesis on a topic within the major field of study.

Registration Requirement. The candidate for the doctoral degree must register each term except summer sessions until the minimum credit (144 quarter hours of course work and thesis research beyond the baccalaureate) and residency requirements are met.

Students who have completed all of the degree requirements except the dissertation must register for at least 12 quarter hours each term (except summer) if they hold assistantships, tuition-and-fee waivers, or fellowships. If a student has completed all degree requirements except the dissertation and does not hold a fellowship, assistantship, or tuition-and-fee waiver, the student may request permission to:

A. Register for zero credit in 499 (thesis research) each quarter (except summer) until the degree is awarded, or

B. Pay a single dissertation fee in lieu of further registration. This fee is equal to three times the amount for tuition alone required for zero credit (Range IV) at the time of payment. By accepting this option, the student will be ineligible for student health insurance, library and laboratory privileges, and an ID card.

Permission to use either option A or B will be considered by the Graduate College upon petition supported by the department. For option B, the department must certify that no use of faculty or staff time or University facilities will be made. Under either option, the student must complete the dissertation within the specified time limitation.

Prior Publication of Research Findings. Candidates engaged in thesis research may find it desirable or expedient to publish prior to the conferring of the degree certain findings that later will be incorporated in the dissertation. In such cases, appropriate acknowledgment of the earlier publication should be included in the dissertation. The Graduate College encourages such publication, but the dissertation may not be published in its entirety before all degree requirements, including the defense of the dissertation, have been completed.

Instructions for Thesis Preparation. The format of the thesis is specified in the leaflet, "Instructions for Preparation of Theses." No later than the date specified in the current calendar of the Graduate College, the candidate must submit to the Graduate College the original and first carbon copy (or two copies reproduced by an approved method) of the thesis and one typewritten copy of an abstract not exceeding 600 words.

Microfilm Fee. Each candidate, following the final examination and acceptance of the thesis, must pay a \$25 microfilm fee, which provides for the microfilming of the complete thesis and the publication of the abstract in *Dissertation Abstracts*.

Examinations. On the recommendation of the department or program, the Dean of the Graduate College appoints a separate committee for the preliminary examination and the thesis defense.

1. The timing, content, and nature (written, oral, or both) of the preliminary examination are at the discretion of the department or program. The examining committee consists of at least five persons, at least two of whom must be members of the Graduate Faculty. The appointment of one member from outside the University is encouraged. The committee reports its recommendations in writing to the Dean of the Graduate College. The committee vote is pass or fail. A can-

didate may not be passed if more than one vote of fail is reported. The committee may require that specified conditions be met before the passing recommendation becomes effective. The dean, on the recommendation of the committee, may permit a second examination. A third examination is not permitted. Failure to complete the degree requirements within five years (departments may specify shorter periods) of passing the preliminary examination will require retaking the examination.

2. On completion of the dissertation, the candidate defends the thesis before a committee consisting of at least four persons, of whom at least two must be members of the Graduate Faculty. The appointment of one member from outside the department, program, or University is encouraged. The committee follows the same rules and procedures as indicated above for the preliminary examination.

Teaching. Except in special cases, teaching is required of all doctoral candidates as part of their professional training and growth.

Time Limitations. A student who is admitted to the Graduate College with a master's degree or its equivalent from another university, or who continues in the Graduate College after completing the master's degree at the University of Illinois at Chicago Circle, must complete the degree requirements within six years after initial registration. A student who is admitted to the Graduate College without a master's degree and proceeds directly to the doctorate must complete degree requirements within ten years of initial registration.

Commencement Exercises

Attendance at commencement is voluntary. However, because doctoral candidates are individually recognized and hooded at the ceremony, they must inform the Graduate College as to whether they will attend.

Confidentiality of Records

As custodian of student records, the University assumes an implicit trust and, accordingly, uses extreme care and concern in recording and disseminating information about students.

The Office of Admissions and Records issues transcripts of official records *only* at the written request of the student. The same holds true for academic information needed for financial assistance or honors recognition. Class schedules are not released to unauthorized persons. Information considered public (available in a public directory, such as name, dates of attendance, curriculum, and degrees and honors earned) is released but only after great care has been taken to identify the originator of such a request as one who demonstrates a legitimate "need to know." For more complete information, consult the University of Illinois at Chicago Circle Policy on the Release of Information Pertaining to Students and the UICC Journal, Volume 1, Number 15, March 9, 1977.

Tuition, Fees, and Other Charges

All students are assessed tuition and fees. The amount varies with the number of credit hours for which the student registers and according to status as a resident or nonresident of Illinois. Most students are assessed in accordance with the following schedule. For exceptions and further information, consult the Office of Admissions and Records, 1-120 Library South.

Students having equivalent medical insurance coverage do not have to pay this fee. They should present evidence of coverage at the time of advance enrollment or residual registration.

Residence Classification is determined by the information given on the application for admission and other credentials. Tuition is assessed accordingly. Further information, includ-

Graduate Tuition and Fees* (Subject to Change) Fall, Winter, and Spring Quarters

	Range I 12 quarter hours and above		Range II 6 through 11 quarter hours		Range III 1 through 5 quarter hours		Range IV 0 credit only
	Res.	Nonres.	Res.	Nonres.	Res.	Nonres.	Res. and Nonres.
Tuition	\$226	\$678	\$154	\$462	\$ 82	\$246	\$ 41
Service Fee	63	63	47	47	28	28	15
Hospital-Medical- Surgical Insurance and Pharmacy Fees	21	21	21	21	21	21	21
Total	\$310	\$762	\$222	\$530	\$131	\$295	\$ 77

8-Week Summer Session

	Range I 8 quarter hours and above		Range II 4 through 7 quarter hours		Range III 1 through 3 quarter hours		Range IV 0 credit only
	Res.	Nonres.	Res.	Nonres.	Res.	Nonres.	Res. and Nonres.
Tuition	\$170	\$510	\$116	\$348	\$ 62	\$186	\$ 31
Service Fee	49	49	37	37	24	24	13
Hospital-Medical- Surgical Insurance and Pharmacy Fees	21	21	21	21	21	21	21
Total	\$240	\$580	\$174	\$406	\$ 107	\$231	\$ 65

*Tuition rates differ for undergraduate students.

ing a brochure titled *Regulations Governing Assessments of Resident or Nonresident Student Fees*, may be obtained from the Office of Admissions and Records, 1- 120 Library South.

Registration in Absentia. Graduate students registered in absentia for zero credit are not required to pay the service and insurance fees.

Deferred Tuition and Fees

Students who do not have a financial aid award or a tuition waiver may pay their tuition and fees in two installments. At least one-half of the assessed tuition and fees must be paid at the time of registration and the deferred portion must be paid by the end of the fourth week of instruction.

Arrangements for personal deferments may be made with a representative of the Bursar's Division during regular registration periods. There is a \$2 charge for this service. Late registration fines and parking fees are not deferrable.

Students will not be permitted to register if they have not paid all their tuition and fees for a previous term. Students with a financial aid award or tuition waiver are not entitled to a personal deferment.

Tuition Exemptions

Students may be exempted from one or more of the following charges if they qualify, under the stated conditions:

Tuition is waived for:

1. Holders of tuition-waiver scholarships.
2. All academic employees of the University or allied agencies on appointment for at least 25 percent but not more than 67 percent of full-time service. Such appointments require service for not less than three-fourths of the term.
3. Full-time (100 percent) academic professional employees who meet required provisions. Details regarding these provisions are available from the Office of Admissions and Records.
4. Nonacademic employees of the University or of allied agencies in status appointments or in appointments designed to qualify for status in an established class (e.g., trainee, intern) who register in regular University courses according to the following schedule: full-time (100 percent) appointment—11 credit hours for fall, winter, spring quarters and 7 credit hours for summer session; part-time (50-99 percent) appointment—5 credit hours for fall, winter, spring quarters and 3 credit hours for summer session. In addition such employees must (1) meet conditions and eligibility for admission as prescribed by the Office of Admissions and Records, (2) not be students as defined in Civil Service Rule 7.7c, and (3) have approval from their employing departments of enrollment and of a makeup schedule to cover any time in course attendance during their regular work schedule. An employee whose total registration is in a higher range than that authorized by the tuition waiver is assessed only the difference between the authorized range and the higher range. Nonacademic employees in a status, learner, trainee, apprentice, or provisional appointment may receive a waiver of tuition in accordance with the schedule for enrollment in courses directly related to their University employment, provided they have made application and received prior approval for enrollment as required by procedures issued by the director of nonacademic personnel and set forth in Policy and Rules—Nonacademic.

5. Holders of graduate tuition-and-fee waivers awarded by the Graduate College.

6. Holders of grants or contracts from outside sponsors that provide payments to cover the total costs of instruction.

7. Cooperating teachers and administrators who receive assignment of practice teachers or TESOL interns. Such persons who register in University courses are exempted from

both tuition and the service fee for one quarter or summer session for each quarter of service rendered. The exemption shall apply to the quarter or summer session of registration, as designated by the student, that is concurrent with, or following, the term of service, but must be applied no later than one calendar year from the beginning of the term of service. Concurrent registration on more than one campus of the University or in University extramural courses constitutes one quarter or session of eligibility for exemption.

8. Persons registered in noncredit seminars only.

9. University employees registered at the request of their departments in noncredit courses especially established to improve the work of the employee.

10. Emeriti.

The *nonresident portion of tuition* (if the enrollee is subject to payment of tuition) is waived for:

1. All staff members (academic, administrative, or permanent nonacademic) on appointment for at least 25 percent of full time with the University or allied agencies.

2. The faculties of state-supported institutions of higher education in Illinois holding appointments of at least one-quarter time.

3. The professional staff in private and public elementary and secondary schools in Illinois.

4. The spouses and dependent children of those listed in 1 and 2. (Dependent children are those who qualify as dependents for federal income tax purposes.)

5. Persons actively serving in one of the armed forces of the United States who are stationed and present in Illinois in connection with that service.

6. The spouses and dependent children of those listed in 5, as long as they remain stationed, present, and living in Illinois.

Fees

The *Service Fee* is annually distributed, proportionally, to the following services and activities: operating expenses and bond debt service of the Chicago Circle Center and Parking; the Student Activities Funding Committee, which distributes funds in support of student activities; student Health Service; student intramural activities; and intercollegiate athletics.

The Service Fee is waived for:

1. All staff members of the University or allied agencies who are on appointment for at least 25 percent of full-time service, provided the appointments require service for not less than three-fourths of the term.

2. Holders of graduate tuition-and-fee waivers awarded by the Graduate College.

3. Students registered in absentia.

4. Students registered only in courses taught off campus.

5. Holders of grants or contracts from outside sponsors if the service fee is charged to the contract or to grant funds.

6. Cooperating teachers and administrators who meet the qualifications of item 6, tuition waiver exemptions.

7. Persons registered only in noncredit seminars.

8. University employees, registered at the request of their departments, in noncredit courses for the purposes of improving their work.

9. Emeriti.

Service Fee Assessments. For fee assessment purposes, a staff appointment must require service for not less than three-fourths of the academic term. Specific dates marking completion of service for three-fourths of the term shall be established by the Chancellor or his designee on each campus. Staff tuition-and-fee privileges do not apply to students employed on an hourly basis in either an academic or non-academic capacity or to persons on leave without pay.

For fee assessment purposes, a permanent nonacademic employee is defined as a person who has been assigned to an established, permanent, and continuous nonacademic

position and who is employed for at least 25 percent of full time. University employees appointed to established civil service positions whose rate of pay is determined by negotiation, prevailing rates, or union affiliation are entitled to the same tuition- and-fee privileges accorded other staff members under the regulations.

Students who resign a staff appointment, or whose appointment is cancelled before they have rendered service for at least three-fourths of the term, become subject to the full amount of the appropriate tuition and fees for that term unless they withdraw from University classes at the same time the appointment becomes void or unless they file clearance for graduation within one week after the appointment becomes void.

The *Course Fee* of \$15 is assessed of all class visitors who are not in Range I in the tuition and fee schedule.

The *Deferred Payment Fee* of \$2 is assessed when arrangements have been made with the Office of Business Affairs to defer the payment of tuition and fees.

The *Hospital-Medical-Surgical Insurance* and *Pharmacy Fees* are the same for all students, regardless of the number of hours for which they are enrolled or of their Illinois residence status. All students enrolled and in attendance at Chicago Circle are covered by a health insurance policy and an accidental death and dismemberment insurance policy for which they pay a fee each term at registration. Eligible dependents of insured students (spouse and/or unmarried dependent children under 19 years of age) may also be insured if the student makes application to the Insurance Office within the first ten days of instruction. The Pharmacy Fee allows the campus Pharmacy, 507 Chicago Circle Center, to fill Health Service or Health-Service-authorized prescriptions at no cost to the student.

Students who withdraw from the University on or after the first day of classes do not receive an insurance fee refund since they remain insured for the balance of the term from which they withdrew. Special provisions exist for students to be covered by this insurance during their approved Off-Quarter Vacation or for the term immediately following graduation, irrespective of their registration for that part of the year. For further information, consult the Insurance Office, 1219 University Hall, Ext. 2870.

A student who presents evidence of insurance in force that provides equivalent coverage may petition the University Insurance Office for a refund of this fee. Refunds are not made on any other basis. The student should submit proof of such coverage to the Insurance Office before the tenth day of instruction. For information regarding the Health Service, see *Student Services*.

The *Late Registration Fine* of \$15 is levied against all students who complete registration after classes have begun.

The *Lost Photo-Identification Card Fee* of \$2 is assessed if the card is lost or destroyed.

The *Lost Student Fee Receipt Card Fee* of 50 cents is assessed if the card is lost or destroyed.

The *Special Examination Fee* of \$10 is assessed when students are re-examined in a course they have failed.

Withdrawal from the University

Withdrawal from the University is governed by specific

regulations that students should observe to protect their academic standing. Failure to withdraw officially from the University results in a grade of E (failure) appearing on the record for each course in which the student is registered. Students dropping the only course for which they are enrolled should follow University withdrawal procedures.

Graduate students who wish to withdraw may secure copies of the withdrawal form from their director of graduate studies or the Graduate College. Graduate students in a degree program should initiate official withdrawal by consulting their department director of graduate studies for approval. The student should also complete a certification pertaining to financial aid and withdrawal questionnaire. Unassigned students should initiate withdrawal proceedings in the Graduate College.

Refunds

Refunds of a portion of tuition and fees may be authorized for students withdrawing from the University or from one or more courses as provided below.

Refunds on Withdrawals from the University. Withdrawal approved in the Graduate College *within the first ten days of instruction of the quarter or the first five days of instruction of the summer session* results in a refunding of the full amount of tuition and fees, *except for the nonrefundable charge*. After these deadlines, no refund is issued.

Refund on Withdrawal from a Course. If withdrawal from a course results in a reduction in the student's program to a lower tuition-and-fee range, the full difference is refunded during the first ten days of instruction of the quarter or the first five days of instruction of the summer session. After these deadlines, no refund is issued.

Refund on Withdrawal by a Visitor. A full refund is issued if the withdrawal is made *within the first ten days of instruction of the quarter or the first five days of instruction of the summer session*. Thereafter, no refund is made.

Refund on Withdrawal to Enter Military Service. A student who withdraws from the University to enter military service must be on active duty within ten days after withdrawal in order for a refund of tuition and fees to be authorized. *It is the student's responsibility* to present proof of this active duty status. The most effective way of presenting such proof is to have the personnel officer of the unit to which the student is assigned certify to the University the date of assignment to active duty.

Full credit is allowed for all courses in which the student has a grade of C or higher and a W, withdrawn without penalty, is recorded for courses in which the grade is below C.

Cancellation of Enrollment. Students who wish to cancel their registration must do so prior to the first day of classes by informing the Office of Admissions and Records, 1-120 Library. In that event, the total amount paid will be refunded.

Transcripts

A student who has paid all University fees is entitled to transcripts free of charge. A transcript or other academic information is provided by the Office of Admissions and Records only at the written request of the student.

Departments and Programs

Graduate programs are listed alphabetically in the following section. Admission and degree requirements for each program are specified. Students must be aware of the Graduate College as well as the department requirements. Exceptions to prerequisites listed in course descriptions may be granted only with the consent of the instructor.

To assist students and advisers in developing plans of study, some course descriptions include information about when courses are scheduled to be taught and who the instructor will be. Students should understand that this information is tentative and subject to change. They should consult the Timetable for official announcements of course schedules.

ADMINISTRATIVE SCIENCE

The Master of Administrative Science program has two areas of specialization: business enterprise administration and public agency administration. The business enterprise administration area includes six skill areas: accounting systems, economics, financial systems, human resource management, management information systems, marketing systems, and policy and administrative practices.

The program is offered jointly by the College of Business Administration, the Department of Political Science in the College of Liberal Arts and Sciences, and the School of Urban Sciences in the College of Architecture, Art, and Urban Sciences. Faculty of cooperating units are listed under Business Administration, Political Science, and Urban Planning and Policy.

Please refer to the Business Administration and Public Agency Administration sections of this bulletin for admission and degree requirements and other information on the Master of Administrative Science program.

ANTHROPOLOGY

Sylvia J. Vatuk, Chairperson of the Department
Waud H. Kracke, Director of Graduate Studies

Professors: Pedro Armillas, Laura A. Bohannon, Susan T. Freeman, Merwyn S. Garbarino, Robert L. Hall, Charles A. Reed

Associate Professors: Paul Hockings, Waud H. Kracke, Michael D. Lieber, James L. Phillips, Jack H. Prost, Sylvia J. Vatuk, Charles P. Warren

Assistant Professors: Howard S. Barden, Lawrence E. Fisher, Lawrence Keeley

The Department of Anthropology offers a program leading to the Master of Arts.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. The verbal and quantitative scores of the Graduate Record Examination are required and will be used in conjunction with other materials submitted in making admission decisions. Three letters of recommendation from former professors and a brief statement outlining the student's professional goals must be submitted. In exceptional cases, students who have averages of less than 4.00 but above 3.75 or who do not have an adequate background in anthropology may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such students may be admitted on limited status and will be expected to remedy department deficiencies before being admitted to regular status.

Degree Requirements

A minimum of 48 quarter hours is required for the master's degree. All candidates must complete the course work outlined below, pass a comprehensive examination, and submit a thesis. Students engaged in specialized thesis research that demands a reading knowledge of a foreign language or a working knowledge of statistics are expected to demonstrate satisfactory comprehension of the relevant language or skill. Foreign students must have adequate facility in the English language.

Students are encouraged to complete a minimum of 36 quarter hours of study before admission to the comprehensive examination for the MA. The distribution of graduate courses is:

16 quarter hours in Anthropology 400—History of Anthropological Theory; 410—Social Organization; 430—Theory and Method in Physical Anthropology; 450—Theory and Method in Prehistory.

16 quarter hours in advanced courses in anthropology or related fields, such as sociology, political science, psychology, or history.

A minimum of one seminar in the anthropological field of specialization.

At least 8 hours but no more than 16 hours in Anthropology 499—Thesis Research.

After three terms of residence a candidate ordinarily is expected to pass a comprehensive examination covering theory and method in social and cultural anthropology, physical anthropology, archeology, and ethnology of one culture area, such as North America, Mesoamerica, Africa, or Europe.

Courses for Graduate and Advanced Undergraduate Students

303. Ceramics for the Archeologist. 4 Hours. Same as Archeological Studies 303, Art-Design 340, and Classics 303. Description and interpretation of pottery and other ceramic materials found in archeological contexts. Manufacture of handmade and thrown pottery. Anthropology 150, 245, 255; Classics 110, 279; and History 201-204 are recommended.

310. Peasant Societies. 4 Hours. Research and reading in the comparative study of peasant societies in diverse regions of the world; special emphasis on a critical review of the anthropological literature delineating a peasant stratum of social organization and defining its characteristics. Prerequisites: Junior standing and 8 hours of social anthropology; or 8 hours of sociology and consent of the instructor.

311. Cultural Problems in Urbanization. 4 Hours. The processes of urbanization and of cultural and societal adjustments to urban life; case studies on the variety of adjustments to urban life. Prerequisite: Anth 213.

314. Kinship, Family, and Household. 4 Hours. Comparative study of the institutions of marriage, family, and household; the extension of kinship norms and values to other aspects of culture and society. Prerequisite: Anth 213.

315. Comparative Religious Movements. 4 Hours. Same as Religious Studies 315. Analysis of religious behavior; special reference to the emergence of messianic cults in Africa and Melanesia and among North American Indians and New World Negroes. Prerequisites: Junior standing and 8 hours of social anthropology; or 8 hours of sociology and consent of the instructor.

316. Economic Life of Primitive Peoples. 4 Hours. Patterns of production, distribution, and consumption in non-Western cultures. Cultural variation in attitudes toward labor and concepts of property and prestige and wealth. Prerequisite: 8 hours of social anthropology; for nonmajors, junior standing and consent of the instructor.

317. The Cross-Cultural Study of Social Control. 4 Hours. Cultural-jural structures in non-Western societies; modes of dispute settlement, nature and range of sanctions, and processes of social control. Prerequisites: Junior standing and Anth 213 or 327.

320. Psychoanalytic Anthropology. 4 Hours. For social scientists. Introduction to Freud's thought and theories on dreams, child development, character, neurosis, and other psychic phenomena; the cross-cultural application of Freud's theories. Anthropological influences in the development of psychoanalytic ego psychology. Prerequisites: Graduate standing or Anth 220; consent of the instructor.

321. Cultural Evolution. 4 Hours. Critical review of theories; examination of the mechanisms of change using ethnographic materials and data on cultural change and cultural contact. Prerequisite: Anth 200.

325. Medical Anthropology. 4 Hours. Significance of anthropological analysis and the cross-cultural perspective for medical care. Medicine as a cultural adaptive system. Social organization, politics, and economics of medical care systems, folk and modern. Folk medicine. Cross-cultural perspectives on psychiatric care. Prerequisite: Anth 200.

327. Primitive Political Systems. 4 Hours. Political structure and competition for power in non-Western political systems; the cross-cultural study of leadership, political values and symbolism, and other aspects of political behavior. Prerequisites: Junior standing and Anth 213.

330. Primate Evolution. 4 Hours. Same as Biological Sciences 330. Paleontology and systematics of fossil primates as illuminated by the anatomy, ecology, and behavior of the living populations. Prerequisite: Anth 231 or BioS 282 or 318.

331. Human Evolution. 4 Hours. Same as Biological Sciences 331. Phylogeny of the primate order and the problems of speciation; particular emphasis on the relative roles of culture and nature as selective forces in human evolution. Prerequisite: Anth 231 or BioS 282 or 318.

332. Human Adaptability. 4 Hours. Biological and cultural interactions with environment in relation to adaptations of human populations. Emphasis on physiological responses of different groups to such environmental stresses as heat, cold, altitude, nutrition, exercise, and disease. Prerequisite: Anth 231.

338. Basic Forensic Anthropology. 4 Hours. Same as Criminal Justice 338. Anthropological methods and techniques used to identify and interpret human remains in paleontology, archeology, and criminal, insurance, and mass disaster investigations. Prerequisites: Junior standing and 8 hours of either anthropology or criminal justice; Anth 231 or consent of the instructor.

342. The Ecology of Colonialism in the Americas. 4 Hours. Same as Latin American Studies 342. The variables that conditioned different patterns of colonization and factors in the evolution of intercultural relations through the post-Columbian period in the Americas. Prerequisites: Junior standing and anthropology or Latin American studies major.

350. Problems in Prehistoric Archeology. 4 to 12 Hours. May be repeated for credit up to a total of 12 hours. Archeological field techniques and principles of the study of prehistory. Case studies from selected areas of the Old and New Worlds. Prerequisites: 12 hours of archeology and consent of the instructor.

351. Prehistory of the Near East. 4 Hours. Consideration of southwestern Asia and northeastern Africa as the core area in which the first civilizations emerged. Emphasis on the late Quaternary to about 5000 BC; the interrelationships between changing environment, human ecology, and cultural evolution. Prerequisite: Anth 251 or consent of the instructor for qualified students from other departments.

352. Early Civilization of the Old World. 4 Hours. Early civilization and incipient urbanization in Eurasia and Africa, with focus on the development of urban centers and archaic states; preconditioning factors in the post-Pleistocene, Mesolithic, and Neolithic Ages. Prerequisite: Anth 251 or 351.

353. Ancient Civilization of Mexico and Central America. 4 Hours. Analysis and interpretation of the archeological evidence on the processes of development of native civilization in the Mesoamerican area, from the beginnings of agricultural settlement to the eve of the Spanish conquest. Prerequisites: 4 hours of anthropology or consent of the instructor.

355. Field Problems in Archeology. 6 to 12 hours. Application of advanced techniques to the solution of special problems of archeological field investigations; laboratory analysis under field conditions at an off-campus location. Prerequisites: Anth 245 or 255 or concurrent registration in Anth 255 and consent of the instructor.

360. Topics in Archeology and Ethnography. 2 to 4 Hours. May be repeated for a maximum of 16 hours of credit. Case studies of investigations in archeology and ethnography using research monographs and other primary sources. Substantive data and related theoretical problems are examined simultaneously. Prerequisite: Junior standing.

361. Problems in Mesoamerican Ethnology. 4 Hours. Same as Latin American Studies 354. Intensive investigation of selected problems from the Mesoamerican area; special emphasis on religion, economics, and social organization. Prerequisite: Anth 261.

362. Problems in African Ethnology. 4 Hours. Survey of the indigenous cultures of Africa; native cultures as reconstructed coterminously with their early historical contacts with the Western world; additional data on present-day African cultures. Prerequisites: Junior standing and Anth 263.

363. Urban Cultures of Africa. 4 Hours. The indigenous urban centers of sub-Saharan Africa and the multicultural and multiracial metropolitan areas of colonial and contemporary Africa; special reference to the processes of segregation and detribalization. Prerequisite: Anth 263 or 362.

364. Problems in North American Ethnology. 4 Hours. Same as Native American Studies 364. Intensive reading and research on special problems of religious, economic, and social systems of New World native peoples. Prerequisite: Anth 264.

365. Problems in Pacific Ethnology. 4 Hours. Ethnological survey of the indigenous peoples of Micronesia, Polynesia, Melanesia, and Australia; special emphasis on the social, economic, and religious life of representative groups. Prerequisites: Junior standing and 8 hours of social anthropology.

366. Problems in South Asian Ethnology. 4 Hours. Same as Asian Studies 366. Theoretical and substantive problems in South Asian social organization; special emphasis on systems of social stratification, kinship and family structure, religion, economy, and political processes in the context of social change. Prerequisites: Junior standing, Anth 213 and 266.

367. Problems in South American Ethnology. 4 Hours. Same as Latin American Studies 367. Intensive reading and research on theoretical and ethnographic problems in South American Indian social structures and cultures. Special attention to the influence of Levi-Strauss's ideas on the formulation of cultural theory in South America. Prerequisite: Graduate standing or Anth 213, 265.

368. Problems in European Ethnology. 4 Hours. Advanced reading and research on the ethnology of rural Europe; study in depth of selected case materials. Emphasis on community, kinship, religious and economic systems, and methods of social control; research techniques and the nature of source materials. Prerequisite: Anth 213.

369. Problems in Southeast Asian Ethnology. 4 Hours. Same as Asian Studies 369. Survey of selected indigenous and minority populations of mainland and insular Southeast Asia; emphasis on culture change and processes of integration. Prerequisite: Anth 268.

380. Problems in Linguistic Analysis. 4 Hours. Same as Linguistics 380. The methods and techniques used in linguistics, with reference to actual language data; emphasis on anthropological applications. Prerequisite: Anth 280 or Ling 305.

395. Seminar on Anthropology. 2 to 4 Hours. May be repeated for a total of 16 hours of credit. For graduate students and anthropology majors. Reading, study, and discussion of selected problems. Prerequisite: Consent of the instructor.

399. Independent Study. 2 to 12 Hours. May be repeated for credit. Independent study under the supervision of a staff member. Prerequisites: Junior standing and approval of the department.

Courses for Graduate Students

400. History of Anthropological Theory. 4 Hours. Survey of contemporary and historical approaches to problems of field and library research. Prerequisite: Consent of the instructor.

410. Social Organization. 4 Hours. Investigation of patrilineal, matrilineal, and bilateral kinship systems; the correlations between kinship systems and social structure; the relationships of ecological factors and kinship organization to rural and urban communities. Reading and research on special problems of kinship, marriage, residence, inheritance, authority patterns, and change. Prerequisite: Consent of the instructor.

411. Visual Anthropology: Principles. 8 Hours. Theory and practice of the use of visual media in behavioral science field research. Lectures, workshops, and field projects. Students who are interested in a sequence of courses beginning with Anthropology 411 should arrange with the department for special advising. Prerequisites: Graduate standing in a social science; formal training in or equivalent knowledge of the photographic process; Anth 400, 430, and 450 for graduate students in anthropology; and consent of the instructor.

412. Visual Anthropology: Field Methods. 4 Hours. Ethnographic film production; researching and filming a suitable sociological subject in northern Illinois; workshop in filming and editing techniques. Prerequisites: Graduate standing in a behavioral science, Anth 411, and consent of the instructor.

413. Visual Anthropology: Analysis. 4 Hours. Ethnographic film editing; workshop in editing techniques; individual guidance in editing students' research films. Prerequisites: Graduate standing in a behavioral science, Anth 411, 412, and consent of the instructor.

414. Psychological Foundations of Anthropological Theory. 4 Hours. Psychological assumptions of selected major anthropological theorists, classical and modern. The implicit and explicit use of psychoanalytic concepts in anthropological thinking and the implications of individual psychology for understanding social structure. Prerequisite: Consent of the instructor.

415. Epistemological Issues in Anthropology. 4 Hours. The nature and limits of anthropological knowledge; the vision of mankind underlying anthropological theory. Surveys the work of various theorists in anthropology, from the explicitly psychologically based to recent structuralist formulations. Prerequisite: Consent of the instructor.

416. Visual Anthropology: Kinesics. 4 Hours. Nonverbal communication; historical survey of the study of nonverbal communication; workshop in recording and analyzing human interactions. Prerequisites: Anth 411 and consent of the instructor.

422. Comparative Methods in Social Anthropology. 4 Hours. Introduction to the several kinds of comparative methods, including



field work and small-sample and large-sample studies. Prerequisite: Consent of the instructor.

425. Seminar on the Uses of Anthropology. 4 Hours. The uses of anthropological research and theory in induced social change. Different approaches of applied and action anthropology in the light of insights that students develop in practical work in various social change settings. Prerequisite: Consent of the instructor.

427. Political Anthropology. 4 Hours. Problems in analysis and description of non-Western political systems and their articulation into modern state systems. The relationship of the levels of political complexity to theories of political behavior. Prerequisite: Consent of the instructor.

430. Theory and Method in Physical Anthropology. 4 Hours. Genetics and selection as correlated with the adaptive radiation of the primates, particularly the biological, environmental, and cultural factors associated with the evolution of man. Prerequisite: Consent of the instructor.

438. Forensic Physical Anthropology. 4 Hours. Same as Criminal Justice 438. Intensive study of human skeletal remains for purposes of personal identification utilizing anthropometric and anthroposcopic techniques. Prerequisite: Anth 338.

450. Theory and Method in Prehistory. 4 Hours. Aims and methods of archeological reconstruction; particular attention to paleoecology, the interpretation of archeological findings in social terms, and the application of scientific knowledge from other fields to archeological problems. Prerequisite: Consent of the instructor.

460. Thematic Research in Anthropology. 2 to 4 Hours. May be repeated for a maximum of 16 hours. For preprofessional students. Investigation of areas of faculty research and specialization, including the unpublished and ongoing research interests of the faculty. Prerequisite: Consent of the instructor.

480. Seminar on Sociolinguistics. 4 Hours. Same as Linguistics 480. Past and current approaches to sociolinguistics; variations of linguistic structure with social structure among different linguistics groups. Prerequisite: Anth 380.

490. Seminar on Comparative Social Institutions in Western and Non-Western Societies. 4 Hours. May be repeated twice for credit. Each seminar selects for intensive study a single problem relating to such social institutions as social stratification, political organization, warfare, or religion. Prerequisite: Consent of the instructor.

491. Seminar on Ethnology. 4 Hours. May be repeated twice for credit. Advanced seminar on the analysis of ethnological data, focusing on the interpretation of field data from selected geographic regions and on correlated theoretical problems. Prerequisite: Anth 400.

495. Developmental Sources of Anthropological Theory. 4 Hours. Seminar on the sources relevant to the current and historical development of anthropological theory primarily as they derive from interaction among the subfields of anthropology but also as these influence, and are influenced by, other disciplines. Prerequisite: Graduate standing or consent of the instructor.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Prerequisite: Consent of the instructor.

ARCHITECTURE

Richard R. Whitaker, Jr., Director of the School of Architecture

Edward L. Deam, Director of Graduate Studies

Professors: Rene Amon, Felix Candela (Emeritus), Leonard J. Currie, Edward L. Deam, Michael S. Gelick, Charles B. Genter, Robert W. Gerstner, Ezra Gordon (Adjunct), George A. Hinds, R. Thomas Jaeger, John Macsai, Richard R. Whitaker, Jr.

Associate Professors: Elliott E. Dudnik, Eugene Holland (Adjunct), Hinman L.P. Kealy, Phillip Kupritz, Roger G. Whitmer

Assistant Professors: Stuart Cohen, Peter C. Pran

Lecturers: Robert Taylor

The School of Architecture offers work leading to the professional degree of Master of Architecture in four areas of specialization: architectural design, building science, environmental studies, and urban design.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 3.75 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and submit at least two letters of recommendation, preferably from professors who are familiar with their recent academic work. In addition, applicants may submit examples of their creative and/or professional work (format: 8½" x 11" black-and-white material), and a 500-word statement describing their professional goals and special interests.

Practitioners in architecture or related environmental design fields who wish to return to school for further study are encouraged to apply, but may be admitted on limited status until they have demonstrated promise of being able to complete the program successfully. Normally, such students must complete 16 quarter hours of work with a grade point average of at least 4.00 before being transferred to regular status.

Degree Requirements

The program is under review and subject to change. Students applying for admission should consult the school for current program and curriculum information and course descriptions and to determine the appropriate term for application.

The requirements for the degree vary according to the student's level of preparation for advanced studies. The school admissions committee will specify at the time of admission which of the three degree options described below the student will be placed in. The student will then meet with a member of the committee to develop a tentative plan of study. Each student is expected to select a permanent adviser by the end of the first term in residence and to formalize the plan of study for the balance of the program.

Option 1—For holders of a professional degree in architecture: at least 48 quarter hours of advanced study are required.

Option 2—For holders of a Bachelor of Arts in Architectural Studies or an equivalent four-year preprofessional degree with a major in architecture: from 48 to 96 quarter hours are required, depending on the student's level of

preparation for advanced study.

Option 3—For holders of the baccalaureate in fields other than architecture: from 96 to 144 quarter hours are required, depending on the student's level of preparation for advanced study.

Minimum requirements for all options: At least 48 quarter hours of graduate-level work beyond the baccalaureate, including at least 20 quarter hours at the 400 level; at least 24 quarter hours in the major area of specialization, including a minimum of 12 quarter hours at the 400 level. At least 8 hours of the required 20 quarter hours of 400-level requirements must be in *regularly scheduled* courses (excluding independent study and reading courses and thesis). All candidates must complete either an architectural study project (Architecture 498) or a thesis (Architecture 499). A minimum of 4 quarter hours in the project or thesis is required, but no more than 16 quarter hours may be counted toward the degree requirements. The thesis shall be defended before a committee appointed by the Dean of the Graduate College.

Courses for Graduate and Advanced Undergraduate Students

301. Architectural Design VII. 6 Hours. Comprehensive problems. Prerequisites: Arch 204 and completion of the fourth-year program in architecture. Gelick, Winter, Spring

309. Undergraduate Architectural Design Thesis. 6, 9, or 12 Hours. May be repeated for a total of 18 hours. Individual problems. Prerequisites: Arch 301 and candidacy for the Bachelor of Architecture.

311. Forensic Architecture. 3 Hours. Legal problems in architecture. Prerequisites: Fifth-year standing and approval of the school.

312. Computer Applications in Architecture. 3 Hours. Computer methods and techniques in design, construction, engineering, and urban planning. Prerequisite: Math 194 or 195.

313. Building Construction Systems I. 6 Hours. Static and dynamic environmental control systems. Prerequisites: Arch 204, 215 and completion of the fourth-year program in architecture. Staff, Fall.

314. Industrialized Building. 3 Hours. Industrialized and prefabricated building systems: materials, production techniques, transportation, and assembly methods. Prerequisites: Fifth-year standing and approval of the school.

315. Logistics of Building Construction and Project Management. 3 Hours. Job scheduling and project control. Construction process simulation, actual site logistics, and productivity. Prerequisites: Fifth-year standing and approval of the school.

316. Building Construction Systems II. 6 Hours. Illumination, heating and air conditioning systems, acoustics; problems of interrelationships with other disciplines and the building industry. Prerequisite: Arch 313. Staff, Winter.

319. Building Technology Thesis. 6, 9, or 12 Hours. May be repeated for a total of 18 hours. Individual problems. Prerequisite: Arch 313.

322. Structural Seminar I. 3 Hours. May be repeated for credit. Selected topics in structural analysis and design. Prerequisite: Completion of 200-level structural engineering courses, Math 220, and the fourth-year program in architecture.

323. Intermediate Structural Analysis. 6 Hours. Analysis of statically indeterminate coplanar and space structures. Prerequisites: Completion of 200-level structural engineering courses, Math 220, and the fourth-year program in architecture.

324. Building Dynamics. 3 Hours. Newton's laws. Rectilinear motion. Rectilinear vibrations of one degree of freedom. Wind and earthquake effects on buildings, design codes, and practices. Prerequisite: Completion of 200-level structures courses.

325. Structural Seminar II. 3 Hours. May be repeated for a total of 9 hours of credit. Selected topics in structural analysis and design. Prerequisites: Arch 225, Math 220.

326. Intermediate Structural Design I. 3 Hours. Plastic and limit methods of design; ultimate strength design. Prerequisite: Arch 323.

327. Intermediate Structural Design II. 3 Hours. Design of prestressed concrete members and structures. Prerequisite: Arch 323.

329. Structural Research Project. 12 Hours. A topic is selected that shows the degree to which a student has assimilated and unified the course material taken thus far and that requires additional individual learning in selected fields. Prerequisites: Arch 322, 326.

331. Architecture Seminar. 1 to 5 Hours. May be repeated for a total of 15 hours. Current problems. Prerequisites: Fourth-year standing and approval of the school. Staff, Fall, Winter, Spring.

332. Architecture Reading Course. 1 to 5 Hours. May be repeated for a total of 15 hours. Individually planned readings on selected topics under the supervision of a faculty member. Prior to registration the student should be advised by the instructor. Prerequisites: Fourth-year standing and approval of the school. Staff, Fall, Winter, Spring.

339. Undergraduate Architectural Humanities Thesis. 12 Hours. Individual problems. Prerequisites: Arch 204 and completion of fourth-year program; candidacy for the Bachelor of Architecture.

343. Professional Practice. 3 Hours. Problems related to the practice of architecture. Prerequisites: Fifth-year standing and approval of the school.

361. Techniques of Greek and Roman Buildings. 4 Hours. Same as Archeological Studies 302, Classics 392, and Materials Engineering 351. Reconstruction and analysis of ancient buildings from the Aegean Bronze Age to the Roman Empire. Description and demonstration of ancient structural principles. Anthropology 150, 245, 255; Classics 110, 279; History 201-204; and History of Architecture and Art 231 are recommended.

373. Ecological Basis of Planning I. 4 Hours. Physical and biological systems and their relationship to physical planning at various scales. Prerequisite: Third-year standing in the College of Architecture, Art, and Urban Sciences or consent of the instructor.

374. Ecological Basis of Planning II. 4 Hours. Environmental impact of physical design. Environmental analysis, preservation, and controls. Prerequisite: Arch 373.

381. Urban and Regional Planning I. 4 Hours. Urban development from prehistory to 1900. The form and order of cities and their evolution. Interrelationship of physical, social, political, and cultural elements. Prerequisite: 8 hours of social sciences or consent of the instructor.

382. Urban and Regional Planning II. 4 Hours. Urban design in the twentieth century. Design theory and planning related to the built environment. Order and form of the city. Interrelationship of physical, social, political, and cultural elements. Prerequisites: Arch 381 and 8 hours of social sciences or consent of the instructor.

391. Architectural Study in Europe. 0 to 17 Hours. Lectures, seminars, studio and independent travel/study in Europe. Architectural design, planning, structures, history, and technology. May be repeated for credit for a maximum of 51 hours. Prerequisites: Architecture 102, 111, 123, and History of Architecture and Art 144; 3.50 overall average; 3.50 average in architecture.

399. Individual Study: Special Topics III. 1 to 9 Hours. May be repeated for credit for a maximum of 18 hours of credit. Selected topics for individual investigation. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

Courses for Graduate Students

401. Advanced Architectural Problems. 8 Hours. May be repeated once. Graduate studio in architectural design. A wide range of project options focusing on specific building types, building and urban systems, and man-environment interaction. Integration of social, economic, technological, esthetic, and professional factors. Prerequisite: Arch 302. Kupritz, Fall, Winter, Spring.

404. Advanced Environmental Design Problems. 8 Hours. May be repeated once. Graduate studio in environmental design. The physiological and psychological aspects of the environment; emphasis on human use and comfort factors. Analysis, programming, and design of spatial systems relating to individual and group use. Prerequisite: Arch 302.

405. Urban Design Problems. 4 to 8 Hours. May be repeated for a total of 16 hours. Graduate studio in urban design. Projects exploring urban analysis, planning, and physical design; emphasis on socio-

economic determinants and urban political-legal systems. Development of planning methods and implementation policies. Metropolitan Chicago is utilized as an area of study. Prerequisite: Architecture major or consent of the instructor and graduate standing. Staff, Fall, Winter, Spring.

431. Advanced Building Systems and Construction. 8 Hours. Analysis of current practice and development of processes and building systems: performance criteria, optimization of alternative systems, integration of environmental systems, structural systems, materials, and building codes and ordinances. Prerequisite: To be determined.

441. Advanced Environmental Systems I. 8 Hours. Static and dynamic systems relating to circulation systems in buildings and urban systems. Prerequisite: To be determined.

442. Advanced Environmental Systems II. 8 Hours. Human comfort and sensory criteria relating to heat, light, and sound; design of appropriate environmental control systems. Analysis of environmental control systems with emphasis on pollution control and energy conservation. Lecture, laboratory. Prerequisite: To be determined.

451. Architectural Administration. 4 Hours. Problems related to the practice of architecture. Organization and professional office administration. Prerequisite: Architecture major.

452. Construction Law. 4 Hours. Legal aspects of architecture and the building construction industry; professional responsibility and contract documents. Prerequisite: Architecture major.

481. Urban Design Seminar. 4 Hours. Analysis of urban design and development projects. Individual reports and discussion. Prerequisite: Arch 405.

494. Architectural Seminar. 2 to 4 Hours. May be repeated for a total of 8 hours. Current problems. Prerequisite: 12 hours of history of architecture. Staff, Fall, Winter, Spring.

498. Independent Study for Graduate Students. 1 to 8 Hours. May be repeated for a total of 16 hours. Individual projects. Prerequisite: Approval of the school. Deam, Kupritz, Staff, Fall, Winter, Spring.

499. Thesis Research. 0 to 16 Hours. May be repeated for a total of 16 hours of credit. Individual research under faculty direction. Prerequisite: Approval of the school. Deam, Kupritz, Staff, Fall, Winter, Spring.

ART AND DESIGN

Morris Barazani, Acting Director of the School of Art and Design

Nancy D. Berryman, Director of Graduate Studies

Professors: Morris Barazani, Nancy D. Berryman, Edward Colker, Roland F. Ginzel, Martin Hurtig, Joseph D. Jachna, Alfred P. Maurice, Robert Nickle, Simon Steiner

Associate Professors: William S. Becker, Leon Bellin, Wayne A. Boyer, Michael Brakke, Dennis Kowalski, Keith A. Morrison, Martin Puryear, Daniel J. Sandin, Hans K. Schaal, Irene Siegel, Robert Suegler, Tadao Takano, Charles H. Wilson

Assistant Professors: Linda Cohn, Sydney Drum, Ernest McBurrows, Hugo McCauley, Esther Parada, Guenther Tetz

The School of Art and Design offers work leading to the Master of Fine Arts with areas of specialization in design (communications design, industrial design, photography, and film) and in studio arts (painting, drawing, sculpture, and printmaking). The program is intended to train advanced students for careers as professional artists and designers.

Admission Requirements

Applications from students with at least two years of advanced undergraduate study in studio arts, design, or photo/film are encouraged. Applicants are considered on an individual basis; however, they must meet the minimum Graduate College requirements. Applicants must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and submit a portfolio of representative work for review by the school admissions committee. Transcripts of all undergraduate (and any graduate) work must be submitted.

In exceptional cases, applicants with grade point averages of less than 4.00 but above 3.75 or with studio deficiencies who can present additional evidence of their potential to complete the program successfully may be admitted. Such applicants will be admitted on limited status and will be required to remedy academic or studio deficiencies before being transferred to regular status.

All applicants should consult the School of Art and Design for application deadline and portfolio requirements.

The School of Art and Design requires the applicant for nondegree status to present the following:

1. Verification of most recent degree from accredited college or university, with possible exception based on professional experience and equivalents.
2. Brief statement of objectives and plans for intended advanced study.
3. Portfolio demonstrating proficiency in area of desired studies, which will be reviewed by appropriate faculty.

Degree Requirements

A minimum of 90 quarter hours of approved graduate work is required. At least 70 quarter hours must be in one of the two areas of specialization (design or studio arts) and must include at least 50 quarter hours at the 400 level, of which 6 quarter hours must be in Art-Design 402—Seminar in Contemporary Theory. Students are encouraged, in consultation with their adviser, to take electives outside the area of specialization and especially to include courses offered by other departments.

Continuation in the program beyond the first 48 quarter hours (the first year in residence) requires both a cumulative

grade point average of at least 4.00 and the recommendation of the graduate advisory committee of the school. The committee bases its recommendation on a formal review of the student's progress and achievements.

In the term in which they expect to graduate, candidates must present for review a public exhibition (paintings, sculpture, film) of their artistic investigations, accomplishments, and works. The format of the presentation will be determined in consultation with the candidate's adviser and will normally include photos, portfolio, film, and essay as appropriate. The candidate will present the School of Art and Design with a documentation of the presentation.

Courses for Graduate and Advanced Undergraduate Students

300. Art and Design Synthesis. 4 Hours. May be repeated for credit. Individual-project course. Students develop projects that synthesize the experience of 200-level courses in the School of Art and Design. Emphasis is on interdisciplinary activities. Prerequisites: 40 hours of 200-level courses in the School of Art and Design and approval of the school.

301. Independent Study. 4 to 12 Hours. Students may enroll in more than one 4-hour section per term or may repeat the course in 4-hour sections in subsequent terms. Independent study under supervision of a staff member in an area of design or plastic and graphic arts not covered in the regular curriculum. The course is offered at the request of the student and only at the discretion of the staff members concerned. Prerequisites: 30 hours of 200-level courses and approval of the school.

302. Seminar on Contemporary Visual Arts. 4 Hours. Special problems concerning the contemporary visual artist and his relation to the other arts. Discussion, readings, lectures. Prerequisite: 24 hours of architecture and art at the 200-level or above.

303. Photography Tutorial. 4 to 16 Hours. Students may enroll in more than one 4-hour section per term or may repeat the course in 4-hour sections in subsequent terms. Independent study course. Sustained projects in any area of photography may be repeated for a total of 16 hours. Prerequisite: AD 265 or 275.

304. Professional Practice. 2 Hours. Professional practice and management, proposals, contracts, and legal issues for designers. Prerequisite: AD 212 or 222.

305. Plastic and Graphic Arts. 4 to 16 Hours. Students may enroll in more than one 4-hour section per term or may repeat the course in 4-hour sections in subsequent terms. Individual projects are developed by each student through tutorial consultation with an assigned instructor; may involve supportive consultation in all areas of the school to permit breadth and invention in media and processes. Prerequisites: 25 hours of appropriate 200-level courses and approval of the school.

306. Experiences in Art Therapy. 4 Hours. Theory and practice of art therapy and its application in areas of rehabilitation and education. Prerequisites: Junior standing and consent of the instructor.

307. Colloquium on Design Theory. 2 to 4 Hours. May be repeated with the approval of the school. Design theories in relation to new technologies and systems of communications and to local and regional problems. Prerequisite: Completion of the foundation program.

308. Computer Art-Design. 4 Hours. May be repeated twice for credit. The computer as a tool for the artist-designer. Prerequisites: Senior or graduate standing and Math 194 or the equivalent.

309. Tekart. 4 Hours. May be repeated twice for credit. Technological art; emphasis on group projects leading to exhibition or event. Prerequisites: Senior or graduate standing and AD 308 or 208.

310. Communications Design. 4 to 16 Hours. Students may enroll in more than one 4-hour section per term or may repeat the course in

4-hour sections in subsequent terms. A comprehensive project in the area of social communications. A total program or a series of related units for use in one or more communications media is developed by each student through tutorial consultation with an assigned instructor. Prerequisites: AD 215 or graduate standing and approval of the school.

312. Mass Printing Technology. 4 Hours. Lectures, field trips, and laboratory experience. Prerequisite: AD 212.

313. Television Media. 4 Hours. Television methods and techniques as related to the needs of the graphic communicator. Prerequisite: AD 212.

320. Industrial Design. 4 to 16 Hours. Students may enroll in more than one 4-hour section per term or may repeat the course in 4-hour sections in subsequent terms. Design of physical systems based on user behavior, technical resources, and environmental factors. System failures and product dysfunctions at the man/machine work space, and environmental levels. Projects are developed by the students through tutorial consultation with an assigned instructor. Prerequisites: AD 225 or graduate standing and approval of the school.

340. Ceramics for the Archeologist. 4 Hours. Same as Anthropology 303, Archeological Studies 303, and Classics 303. Description and interpretation of pottery and other ceramic materials found in archeological contexts. Manufacture of handmade and thrown pottery. Anthropology 150, 245, 255; Classics 110, 279; and History 201-204 are recommended.

342. Sculpture III: Advanced Studio. 8 Hours. Must be repeated twice. Experiment and study in depth of contemporary concepts, processes, and techniques to develop a personal, creative visual language. Primarily self-directed under the supervision of the entire sculpture faculty. Prerequisite: Credit or concurrent registration in AD 241.

350. Independent Study in Printmaking. 2 to 6 Hours. May be repeated for a maximum of 12 hours of credit. Independent study in an area not covered by existing course offerings or exploration in greater depth of a problem or area covered in a previously taken course. Prerequisite: 20 hours of printmaking, including AD 250 and any four of AD 251, 252, 253, 254, 351.

351. Advanced Printmaking Studio. 4 Hours. May be repeated once. Expansion of basic techniques and introduction to new media; emphasis on experimentation and innovation. Prerequisite: 12 hours of printmaking, including AD 250 and any two of AD 251, 252, 253, 254.

360. Photography Colloquium. 1 Hour. May be repeated for a total of 9 hours of credit. Films, lectures, and discussion on the application and appreciation of photography. Special lectures on related subjects. Prerequisite: Completion of the foundation program in art.

370. Documentary Film Production. 4 Hours. May be repeated once for credit. Group or individual projects dealing with the communication of fact through the motion picture medium. Prerequisite: AD 273.

Courses for Graduate Students

402. Seminar on Contemporary Theory. 1 Hour. Required every term of residence. Graduate seminar on developments and current issues in contemporary design and studio arts; major philosophies, debates, and social/environmental aspects. May include visiting lecturers, critics, and discussants. Prerequisite: Approval of the school graduate faculty committee and the student's adviser(s).

410. Advanced Design. 4 to 16 Hours. May be repeated for up to 64 hours of credit. Individualized graduate study; projects for creative research design through consultative agreement with graduate advisers. May involve supportive consultation in all areas of school disciplines to foster breadth and enlargement in processes and means. Prerequisite: Approval of the school graduate faculty committee and the student's adviser(s).

430. Advanced Studio Arts. 4 to 16 Hours. May be repeated for up to 64 hours of credit. Individualized graduate study; creative projects and research on studio arts through consultative agreement with graduate advisers. May involve supportive consultation in all areas of school disciplines to foster breadth and enlargement in processes and means. Prerequisite: Approval of the graduate faculty committee and the student's adviser(s).

BIOENGINEERING

Irving F. Miller, Head of the Program and Director of Graduate Studies

Professors: Gyan C. Agarwal, Raid Barmada,* Lyndon R. Babcock,* Joseph C.F. Chow, Daniel Fiat,* Morton F. Goldberg,* Earl E. Gose, Alois R. Hastreiter,* Edward R. Hermann,* Edward A. Lichter,* Ruy V. Lourenco,* Thaddeus Marczynski,* Sabath F. Marotta,* Bruce H. McCormick, Irving F. Miller, William D. O'Neill, Kenneth M. Rosen,* William Rostoker, Albert B. Schultz, Rodrich W. Walter,* Arthur H. Wolff,* Bert L. Zuber

Associate Professors: John P. Bederka,* Louis A. Benevento,* Badi M. Boulos,* Gary R. Brenniman,* Gerald L. Gottlieb (Adjunct), Jeffrey Levett (Adjunct), Sidney Levitsky,* Alvin L. Miller,* Svante O. Rolander,* Richard A. Wadden *

Assistant Professors: Thomas Andriacchi (Adjunct), Robert D. Dresdner, Ljubomer Djordjevich (Adjunct), Gordon L. Humphrey,* Alvin L. Miller,* Jacob T. Wilensky*

*Principal appointment at the University of Illinois at the Medical Center.

Work is offered leading to the Master of Science and the Doctor of Philosophy.

Specialization in bioengineering trains the student to apply engineering concepts and methods to the life sciences and medicine. Areas covered include the application to living systems of the principles of information processing, communication, and control theory; cybernetics, artificial intelligence, and pattern recognition; bioinstrumentation, prostheses, and artificial organs; and some aspects of biophysics. This program is for graduates of life sciences, physical sciences, or engineering curricula. Students from the life sciences are expected to emphasize mathematics, engineering, and physical sciences in their initial course work; students from the physical sciences are expected to concentrate initially on the life sciences.

Admission Requirements

Master of Science

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. In exceptional cases, students who have averages of less than 4.00 but above 3.75 or practicing engineers who wish to return to school for further graduate instruction may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such students may be admitted on limited status and will be

required to remedy department deficiencies before being admitted to regular status. The minimum transcript requirement is the same as that of the Graduate College (p. 31).

By intercampus agreement, the program is available to students registered at either the Chicago Circle campus or the Medical Center campus.

Doctor of Philosophy

The Doctor of Philosophy in Bioengineering is jointly administered by the College of Engineering of the University of Illinois at Chicago Circle and the University of Illinois at the Medical Center through the Intercampus Bioengineering Coordinating Committee. The purpose is to train people to do the research that will develop systems that apply modern technology to problems of living systems and health care.

Applicants for admission to the Doctor of Philosophy program must be highly motivated superior students. They must also meet the entrance requirements of the appropriate Graduate College (UICC or UIMC). The program is designed primarily for students with degrees in physical sciences, engineering, mathematics, biology, or medicine. Students from other areas are also encouraged to apply if their backgrounds indicate a reasonable chance of success in the program.

Submission of Graduate Record Examination scores (the verbal and quantitative test as well as the advanced test in the applicant's undergraduate field) is required but may be waived under special circumstances.

Since students will be entering the program from a wide variety of disciplines, many will have deficiencies in a number of important areas. To remove any deficiencies in prerequisites or background requirements, the student may be required to take undergraduate or specialized remedial courses, chosen in consultation with the adviser.

Nondegree Admission

Applicants for admission to the Bioengineering Program on a nondegree basis may be accepted provided they hold a baccalaureate from an accredited college or university.

Degree Requirements

Master of Science

1. *Required Courses:* One sequence from (a) through (f): (a) BioS 363, 364 (10 hours); (b) BioS 363, PY 369, PY 469 (13 hours); (c) BioS 363, PY 371, PY 471 (13 hours); (d) BioS 364, PY 369, PY 469 (13 hours); (e) BioS 364, PY 370, PY 470 (13 hours); (f) two of PY 369, 370, 371, plus one of PY 469, 470, 471 selected to correspond to one of the 300-level courses taken (13 hours)

BioE 354 (4 hours)

BioE 497 (0 hours)

BioE 499—Thesis Research (8 hours minimum)

Electives to make a total of at least 48 hours of credit

2. At least three 400-level courses must be taken, excluding research-type courses such as 493, 497, or 499. Of these, at least two must be in bioengineering.

3. Students are required to choose electives in such a way that an area of concentration can be defined. An area of concentration should include at least three related courses. Examples of areas of concentration would be (a) bioinstrumentation and systems; (b) biomedical materials and devices; (c) automated classification and diagnosis; or (d) any of the areas of concentration within the PhD program.

4. By the time students have completed one full quarter of work, they are required to file a plan of study for the complete MS program. It must have the approval of the adviser

and the bioengineering graduate committee.

5. Students must be continuously registered for a minimum of 2 hours each term in any three terms out of the calendar year, between the time they enter the program and the time they receive the MS.

Doctor of Philosophy

The PhD program in bioengineering requires 144 quarter hours of credit beyond the baccalaureate, consisting of a reasonable distribution of course work between UICC and UIMC. Of this total, at least 32 quarter hours must consist of 400-level courses and an additional 48 quarter hours of thesis research. A student who enters the program with an MS may be allowed to transfer up to 48 quarter hours of credit toward the degree. Specific course requirements for students entering with the MS may be waived if the student can demonstrate equivalent background.

The four areas of concentration:

1. Health Care and Environmental Systems
2. Medical Instrumentation
3. Physiological Systems and Biocontrol
4. Prosthetics and Artificial Organs

The student must complete, in one of these areas, at least 36 quarter hours of courses chosen in consultation with the adviser. In addition to these areas of concentration, a candidate with other interests may design an area of concentration in consultation with the adviser, subject to approval by the candidate's doctoral advisory committee.

These courses are required of all students for a total of 28 to 34 hours:

One sequence from (a) through (f): (a) BioS 363, PY 369, PY 469 (13 hours); (b) BioS 363, PY 371, PY 471 (13 hours); (c) BioS 364, PY 369, PY 469 (13 hours); (d) BioS 364, PY 370, PY 470 (13 hours); (e) BioS 363, 364, and any PY course of at least 3 hours credit, *except* PY 370 and PY 371 (13 hours); (f) two of PY 369, 370, 371, plus one of PY 469, 470, 471 selected to correspond to one of the 300-level courses taken (13 hours)

BioE 490—Internship (6-12 hours)

BioE 354, 379, 497 (9 hours)

A qualifying examination, normally held after completion of one full year of graduate study, determines the depth of the student's previous academic experience. Near the completion of formal course work, the student submits a thesis proposal for the faculty approval. At that time, the student also takes a preliminary examination to determine the depth of knowledge in one of the broad academic areas covered by this program. After the preliminary examination has been passed, the student is expected to continue and to intensify the research leading to the doctoral thesis. Finally, upon completion of the thesis the student is examined by a faculty committee appointed by the Intercampus Coordinating Committee. A PhD handbook, setting out these requirements, is available from the program office.

Courses for Graduate and Advanced Undergraduate Students

Note: Many courses pertinent to the graduate program in bioengineering are offered by other UICC engineering departments and at UIMC. Students should consult the appropriate listings and call or write the Bioengineering Program for details.

307. Pattern Recognition I. 4 Hours. Same as Information Engineering 307 and Systems Engineering 307. The design of automated classification systems. Decision theory. Parametric and non-parametric procedures for the classification of patterned data sets. Clustering and unsupervised learning. Prerequisites: Math 370 or SysE 342, and InfE 270 or consent of the instructor. Gose, Staff, Fall.

315. Mechanics of the Human Musculo-Skeletal System. 4 Hours. 4 hours lecture, 2 hours laboratory per week. Same as Materials Engineering 315. Use of rigid and deformable body statics and rigid body dynamics to analyze various aspects of the human musculo-skeletal system from the viewpoint of engineering mechanics. Skeletal structure, kinematics of body joints, and mechanical properties of body tissue. Anthropometry, motion range measurement, kinematic analysis, statically determinate and indeterminate analyses of body forces, stress analyses, and dynamic response analyses. Applications of mechanics to health problems. Laboratory experiments and computational projects. Prerequisite: BioE 393 or MatE 204 and 211. Schultz, Winter.

341. Man-Machine Systems. 4 Hours. Same as Systems Engineering 341. Specific system areas in which the role of man in the system operation requires a systematic analysis of the human component in the system. Critical concepts, variables, and techniques involved in optimum design of human-operated systems. Laboratory experiments on man-machine interactions. Prerequisite: SysE 315. Agarwal, Spring.

350. Prostheses and Artificial Organs. 4 Hours. The special problems encountered in the design of organ replacements as engineering devices. Suborgan replacements, circulatory assist devices, artificial kidneys, and other organ systems. Prerequisites: BioE 200, BioS 363, 364, EnrE 211 or the equivalent, MatE 230. Miller, Winter.

352. Biocontrol. 3 Hours. Same as Information Engineering 352. Applicability of control systems theory to physiological systems, including the pupil system and eye and hand movement systems, utilizing such techniques as Fourier analysis, Nyquist stability criteria, and cross-correlation. Prerequisites: InfE 311 and BioS 363 or 364 or consent of the instructor. Zuber, Spring.

353. Biocontrol Laboratory. 3 Hours. Same as Information Engineering 353. Experimental counterpart of Bioengineering 352. Motor coordination, crayfish photoreceptor, human pupil, eye movement. Prerequisite: Credit or registration in BioE 352. Gose, Spring.

354. Bioinstrumentation: Transducers. 4 Hours. Same as Information Engineering 354. Energy conversion; detailed discussion of transducers used in biological research. Prerequisites: BioE 200, InfE 240, 311. Zuber, Winter.

355. Engineering Biophysics. 4 Hours. Introduction to biophysical mechanisms at the molecular, cellular, and organ levels. Thermodynamic aspects of biological processes, solutions of macromolecules; chemical equilibrium and kinetics; transport processes; diffusion; viscosity; quantitative description and modeling of biophysical mechanism. Prerequisites: Math 220, EnrE 201 or Chem 114, and any two of BioS 100, 101, 102. I.F. Miller, Fall.

356. Materials in Bioengineering. 4 Hours. Same as Materials Engineering 356. Analysis of problems associated with prostheses and other implanted devices, both medical and dental. Prerequisites: MatE 230, BioS 363 or 364. Rostoker, Spring.

359. Mammalian Neuroanatomy. 6 Hours. Same as Biological Sciences 359 and Information Engineering 359. Introduction to the structure of the mammalian central nervous system. Prerequisites: BioS 280 or 281 or consent of the instructor.

379. Real-Time Data Processing. 4 Hours. Same as Information Engineering 379. Techniques for acquisition and digital representation of data obtained from analog and digital devices. Methods for digital signal processing. Data reconstruction and display. Applications such as medical data acquisition and analysis and closed loop sampled data control. Implementation of techniques on a real-time dedicated mini- and microcomputer. Individual projects are required. Prerequisites: Math 195, InfE 311 or the equivalents.

380. Physiological Applications of Real-Time Data Processing. 3 Hours. Same as Information Engineering 380. Application of on-line real-time data processing techniques to problems in physiological experimentation, patient monitoring systems, and problems associated with biological data projects include the acquisition and processing of biological data on a small dedicated laboratory computer. Prerequisite: Credit or registration in BioE 379 or InfE 379.

391. Seminar. 1 to 4 Hours. May be repeated for additional credit. Topics to be arranged. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

393. Special Problems. 2 to 4 Hours. May be repeated for additional credit. Special problems or readings by arrangement with the faculty.

Prerequisites: Senior standing and consent of the instructor. Staff, Fall, Winter, Spring.

396. Senior Design I. 4 Hours. Design consideration for biomedical devices, including marketing and manufacturing, legal and social constraints as well as traditional engineering design concepts. Prerequisites: Senior standing and SysE 225.

397. Senior Design II. 4 Hours. Application of principles of engineering and engineering design methodology to the solution of a large-scale design problem. Prerequisite: BioE 396. Staff, Winter, Spring.

Courses for Graduate Students

407. Pattern Recognition II. 4 Hours. Same as Information Engineering 407. Computer-based methodology for the organization and representation of knowledge. Knowledge-based pattern recognition. Inference of pattern descriptions. Applications to clinical decision support, processing of natural language, and robotics. Prerequisite: BioE 307. Gose, Winter.

409. Pattern Recognition III. 4 Hours. Same as Information Engineering 409. Advanced pattern recognition techniques and applications. Projects. Review of current literature. Prerequisite: BioE 407. Gose, Spring.

451. Advanced Biocontrol. 4 Hours. Same as Information Engineering 451. Mathematical modeling and analysis of biological systems, emphasizing techniques of control engineering. Laboratory experiments on control systems of pupil eye movement and sensory motor coordination. Prerequisite: BioE 353. Zuber, Fall, alternate years.

453. Advanced Systems Physiology. 4 Hours. Same as Information Engineering 453. Intensive treatment of selected neurophysiological topics; emphasis on systems of organizations. Prerequisite: BioE 353. Staff, Spring, alternate years.

457. Analysis of Visual Systems. 4 Hours. Same as Information Engineering 457. An advanced course covering in detail important research areas of the visual system. The fundamental importance of physical, chemical, and physiological processes as related to vision is stressed. Prerequisites: InfE 453 and consent of the instructor. Offered in alternate years.

460. Biotransport I: Diffusional Processes. 4 Hours. Same as Energy Engineering 460. Principles of solute and water transport across natural and synthetic membranes. Natural and artificial membrane structure and function. Passive and active membrane transport processes. Excitability. Irreversible thermodynamics as applied to membrane transport. Prerequisites: EnrE 304, or BioE 355 and consent of the instructor. I.F. Miller, Winter.

461. Biotransport II: Flow Processes. 4 Hours. Same as Energy Engineering 461. Principles of flow in living systems. Structure and function of the human circulatory system; rheology of blood and other biofluids; microcirculation; pathological conditions and their detection; gas transport. Prerequisite: EnrE 317 or BioE 355. Chow, Spring.

484. Bioinstrumentation: Systems. 3 Hours. Same as Information Engineering 484. Analysis of systems used in biological and medical instrumentation. General principles and specific electrical, mechanical, and optical aspects of instrumentation systems. Offered in alternate years.

490. Internship in Bioengineering. 1 to 4 Hours. May be repeated. A minimum of 6 hours is required of all doctoral students. Satisfactory/unsatisfactory grade only. Current clinical practice experience in a health care setting culminating in a written and oral report. Prerequisites: Physiology 371 (Medical Center) or the equivalent, BioE 354, and consent of the instructor. I.F. Miller, Fall, Winter, Spring.

493. Individual Research. 2 to 8 Hours. Research on special problems not included in thesis research. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

497. Colloquium on Bioengineering. 0 to 1 Hour. Recent innovations in bioengineering theory and practice presented by invited speakers, faculty, and doctoral students. All doctoral students in the program are required to attend during every term of their residence and make at least one presentation. Miller, Fall, Winter, Spring.

498. **Seminar on Bioengineering.** 1 to 4 Hours. Systematic review of special topics; emphasis on current research. Prerequisite: Consent of the instructor. Staff, Winter, Spring.

499. **Thesis Research.** 0 to 16 Hours. May be repeated for a maximum of 16 hours of credit. Research on thesis topic. Prerequisites: Consent of the instructor and approval of the research prospectus by the thesis supervisor. Staff, Fall, Winter, Spring.

BIOLOGICAL SCIENCES

Stanley K. Shapiro, Head of the Department
Dennis Nyberg, Director of Graduate Studies

Professors: Louise E. Anderson, David Bardack, G. Benjamin Bouck, Howard E. Buhse, Jr., Donald A. Eggert, Sidney F. Glassman, Bernard Greenberg, Elmer B. Hadley, M.A.Q. Khan, David B. Mertz, Darrel L. Murray, Thomas L. Poulson, Albert S. Rouffa, Fritz Schlenk (Emeritus), Stanley K. Shapiro, Eliot B. Spiess, Kenneth Swiatek (Visiting)

Associate Professors: Shepley S.C. Chen, Michael R. Cummings, Merrill L. Gassman, John F. Lussenhop, John A. Nicolette, Dennis Nyberg, Emanuel D. Pollack (Visiting), Jack H. Prost, Robert B. Willey, Ruth L. Willey, Heman J. Witmer

Assistant Professors: Stephen L. Barclay, Jaswant S. Bhorjee, Sharon Emerson, Manuel Goldman, F. Marion Hulett, Gary W. Hyatt, Susan Liebman, William A. Mego, Leo Miller, Donald A. Morrison, Paul D. Pezalla, Robert Webster, Stephen G. Weller, George J. Wilder

Adjunct Professors: Marion T. Hall (Morton Arboretum), Robert F. Inger (Field Museum of Natural History)

The Department of Biological Sciences offers work leading to the Master of Science and the Doctor of Arts and intercampus programs with the Department of Pathology (UIMC) and with the School of Life Sciences (UIUC) leading to the Doctor of Philosophy.

Modern facilities for graduate research in biological sciences include animal quarters, plant growth rooms and greenhouses, transmission and scanning electron microscopes, a library, a computer center, and well-equipped laboratories for individual research. The University owns the Woodworth Prairie Preserve and has ready access to historically important natural areas including Lake Michigan, the Indiana Dunes National Lakeshore, the Morton Arboretum, and 67,000 acres of the Cook County Forest Preserve District. Cooperative study programs utilize the facilities of the nearby Field Museum of Natural History, the Shedd Aquarium, the University of Illinois at the Medical Center, and the Argonne National Laboratory.

The department is a member of the Institute for the Study of Developmental Disabilities (ISDD), which promotes research and training activities in the area of developmental disabilities. Interested students should consult the director of ISDD or the department head.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study, and at least 33 quarter hours in biological sciences, excluding 100-level (introductory) courses, that indicate a broad, well-balanced selection of courses in biology. In exceptional cases, students who have averages of less than 4.00 but above 3.75 may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such students may be admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status.

Collateral Requirements. Chemistry (including two quarters of organic chemistry), one year each of physics and mathematics, preferably including introductory calculus. Deficiencies determined by the Graduate Committee of the Department of Biological Sciences and the student's adviser must be made up early in the student's residence.

Applicants who have majored in fields other than biological sciences are encouraged to consult the department prior to making formal application for admission.

All students who apply for admission must submit the following:

A completed application form.

Complete transcripts of undergraduate (and any graduate) course work.

Three letters of recommendation, preferably from professors who are familiar with the student's recent work.

A statement of about 300 words presenting the applicant's reasons for desiring to take graduate work in biological sciences and the relationship of this work to professional and other goals.

Graduate Record Examination scores for both the aptitude test and the advanced test in biological sciences.

A student seeking admission for post-master's study must submit copies of any theses prepared in satisfaction of the master's degree.

Nondegree Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. In exceptional cases, students who have averages of less than 4.00 may be admitted if they can show evidence of substantial promise of ability to do graduate course work.

All students who apply for nondegree admission must submit the following:

A completed application form.

Complete transcripts of undergraduate (and any graduate) work.

Additional admissions materials, such as national test scores, letters of recommendation, and records of scholarly and professional accomplishment may also be submitted as evidence of promise of ability to do graduate course work.

Degree Requirements

Master of Science

When a student is admitted to the master's program, a temporary faculty adviser is appointed by the director of graduate studies in consultation with the student. Within the first two weeks of the first term an introductory interview is held

by an interview committee individually appointed for each student. This committee, consisting of three faculty members, one of whom is the student's temporary faculty adviser, represents at least three of the following four general areas;

1. Genetics, including evolutionary biology
2. Cell physiology and biochemistry
3. Organismic structure, function, and development
4. Environmental and population biology

The committee reviews the student's credentials, assesses academic interests, and, together with the student, plans course work. Academic deficiencies revealed by the interview should be eliminated as quickly as possible.

The student may elect one of three options: the first emphasizes independent research and is designed for those who may proceed toward the doctorate; the second is for the student whose prime interest lies in teaching and education; the third is based primarily on satisfactory completion of course work together with a nonthesis research option.

For any of these options the student, in consultation with the director of graduate studies, chooses a principal adviser no later than the end of the second term. By the end of the third term in residence, an advisory committee, whose function is to oversee the student's academic progress, will be appointed by the Dean of the Graduate College on the recommendation of the principal adviser and the graduate program committee. The composition of this committee is described under each of the options.

Option 1

The advisory committee consists of the principal adviser and at least two other faculty members from disciplines pertinent to the student's research interest.

Candidates for this option must complete 48 hours of graduate-level courses, of which at least 18 hours must be in 400-level courses. These must include at least 8 hours of 400-level courses other than Biological Sciences 493—Independent Research and Biological Sciences 499—Thesis Research. A maximum of 16 quarter hours in Biological Sciences 499—Thesis Research may be credited toward the degree.

In addition, students must pass a final examination that will be taken after all course work and the thesis are completed. This examination will be conducted by the student's advisory committee and will cover the thesis research and related subject matter.

Option 2

The advisory committee consists of the principal adviser, who is a specialist in biological sciences education, and at least two other faculty members from disciplines pertinent to the student's area of concentration.

Candidates for this option must complete 48 hours of graduate-level courses, including:

1. At least 8 hours of course work in the area of concentration selected in consultation with the advisory committee.
2. At least 18 hours of 400-level courses, of which 8 or more hours must be other than Biological Sciences 493 or 499.
3. At least 8 hours of Biological Sciences 493 in the form of an extended laboratory research project (a thesis is not required).
4. A minimum of 12 hours of course work in biological sciences education.

Additional courses should be selected by the student, in consultation with the committee, to provide a broad biological sciences background. Students who elect Option 2 take a final examination covering their general knowledge of biology, their specific area of biological sciences concentration, and the mechanisms of communicating biological sciences concepts. All MS candidates are required to participate in un-

dergraduate teaching. A minimum of two terms of a one-half time appointment or the equivalent is required.

Option 3

The advisory committee consists of the principal adviser and at least two other faculty members who represent two of the four areas of specialization within the department. The student must satisfactorily complete the following requirements:

1. 60 quarter hours of graduate-level courses exclusive of Biological Sciences 499—Thesis Research. Of these 60 quarter hours:

- a. 18 quarter hours must be at the 400 level
- b. 45 quarter hours must be in the biological sciences.

2. An acceptable research report based upon:

- a. A maximum of 8 quarter hours of Biological Sciences 493—Independent Study or

- b. Research other than Biological Sciences 493 (i.e., professional experience).

3. A written and/or oral comprehensive examination covering two areas of specialization within the department (to be completed no later than one term following the completion of the 60 quarter hours). The examination will be administered by the student's advisory committee.

Doctor of Arts

Course work requirements are 144 hours at the graduate level, of which at least 48 must be at the 400 level, at least 12 in other disciplines (such as chemistry, geography, geological sciences, information engineering, mathematics, physics, or psychology), and 32 hours including the 400-level Doctor of Arts courses, a teaching practicum, and associated course work.

The student must complete a thesis devoted to a research problem in the biological sciences and a thesis on a research problem related to teaching the biological sciences. Applicants who have already been granted the PhD may be considered to have completed the first of the above thesis requirements.

Doctor of Philosophy

The requirements for the PhD are 144 quarter hours of graduate-level course work beyond the baccalaureate including a minimum of 48 hours in thesis research. In addition, the student must pass a preliminary examination administered by the adviser and a four-person committee. The appropriate time for this examination will be determined by the student and the committee. A satisfactory original dissertation must be presented and an oral defense of the thesis passed. At the discretion of the student's committee, the student may be required to demonstrate a reading knowledge of one or two foreign languages.

Teaching

Candidates for all degrees are required to participate in department teaching.

Courses for Graduate and Advanced Undergraduate Students

303. Quantitative Biology I. 5 Hours. Quantitative ideas and mathematical models in the development of biological theory and as a basis for biological experimentation. Lecture, laboratory. Prerequisites: Math 131 and either BioS 240, 241 or BioS 315. Mertz, Fall.

304. Cytology Laboratory. 2 Hours. Advanced cytology; emphasis on microscopical methods. Prerequisites: BioS 261, concurrent registration in BioS 309, and consent of the instructor. R.L. Willey, Fall.

305. Quantitative Biology II. 5 Hours. Formal aspects of biological experimentation, including the basic aspects of experimental design; interpretation of biological data. Lecture, laboratory. Prerequisite: BioS 303. Mertz, Winter.

307. Biological Methods for Teachers. 3 Hours. Investigation of methodological subjects, conducted primarily as a practicum; emphasis on the development of competencies. Prerequisites: Senior standing and 40 hours of biological sciences. Bond, Murray, Winter.

308. Population Biology. 5 Hours. Introduction to the evolution, genetics, and geography of biological populations. Dynamic processes of population biology, quantitative theory and case histories from microbial, plant, human, and other animal populations. Lecture, laboratory. Prerequisites: BioS 240 and credit or concurrent registration in Math 131. Mertz, Nyberg, Spring.

309. Cytology. 3 Hours. Structure and function of cells as revealed through historical development and modern research techniques. Lecture. Prerequisite: Two years of biological sciences. R.L. Willey, Fall.

310. Field Problems in Biology. 2 Hours, Interterm; 8 Hours, Full Term. May be taken either between terms (registration during preceding term) or for a full term. Credit is given on completion of a satisfactory written report. Field research in natural habitats. Use of quantitative sampling, detailed observations, and field experiments for the solution of selected systematic, biogeographic, and ecologic questions. Prerequisites: One year of biological sciences, a biology field work course, and consent of the instructor. Staff.

314. Plant Development. 5 Hours. Analysis of growth in plants; modern concepts of cellular differentiation; control of plant development by intrinsic, hormonal, and environmental factors. Lecture, laboratory. Prerequisites: Chem 234, BioS 232, 313, or 333, and consent of the instructor. S. Chen, Winter.

315. Principles of Ecology. 3 Hours. Composition and distribution of biotic communities, plant and animal; emphasis on the interplay of physical and biological factors of the environment. Prerequisites: One year of biological sciences. Lussenhop, Poulson, Fall, Spring.

316. Invertebrate Paleontology. 4 Hours. Same as Geological Sciences 316. Phylogeny, morphology, and ecology of the fossil invertebrates. Prerequisites: BioS 218 and consent of the instructor.

317. Community Ecology. 5 Hours. Concepts of trophic structure, niche, competition, coexistence, and diversity are used to examine theories of community origin, change, structural-functional patterns, and distribution; emphasis on experimental bases and current problems. Prerequisites: BioS 315 and either 324 or 380. Lussenhop, Winter, Spring.

318. Vertebrate Paleontology. 4 Hours. Same as Geological Sciences 318. Phylogeny, morphology, and ecology of the fossil vertebrates. Prerequisites: BioS 281 and consent of the instructor.

319. Paleobotany. 5 Hours. Same as Geological Sciences 319. Structure, phylogeny, and stratigraphic distribution of representative fossil plants. Lecture, laboratory, and field trips. Prerequisite: One year of biological sciences. Eggert, Spring.

320. Field Botany. 5 Hours. Flora of the Chicago region. Lecture, laboratory, field trips. Prerequisite: One year of biological sciences. Glassman.

321. Plant Geography of North America. 4 Hours. Ecological and systematic treatment of vegetation regions and principal subdivisions; emphasis on environmental factors and floras. Prerequisite: BioS 220 or 315. Glassman, Winter.

322. Advanced Taxonomy of Flowering Plants. 4 Hours. Emphasis on theories and data for evolution within groups of flowering plants. Prerequisite: BioS 220 or 345. Glassman, Winter.

325. Plant Anatomy. 5 Hours. The internal structure of vascular plants; emphasis on structure and function. Lecture, laboratory. Prerequisite: One year of college biology or the equivalent. Eggert, Wilder, Winter.

326. Plant Physiology I. 3 Hours. Structure and function of the plant cell; emphasis on membrane function, water relations, solute translocation, and photosynthesis. Prerequisites: One year of biological sciences and Chem 234. Gassman, Fall.

327. Plant Physiology II. 3 Hours. Physiology of plant growth and

development; photomorphogenesis and photoperiodism, flowering, and phytohormones. Prerequisites: One year of biological sciences and Chem 234. Gassman, Spring.

328. Plant Physiology Laboratory I. 2 Hours. Laboratory techniques. Prerequisite: Concurrent registration in BioS 326. Gassman, Fall.

329. Plant Physiology Laboratory II. 2 Hours. Laboratory techniques. Prerequisite: Concurrent registration in BioS 327. Gassman, Spring.

330. Primate Evolution. 4 Hours. Same as Anthropology 330. Paleontology and systematics of fossil primates as illuminated by the anatomy, ecology, and behavior of the living populations. Prerequisite: Anth 231 or BioS 282 or 318. C. Reed, Fall.

331. Human Evolution. 4 Hours. Same as Anthropology 331. Phylogeny of the primate order and the problems of speciation; particular emphasis on the relative roles of culture and nature as selective forces in human evolution. Prerequisite: Anth 231 or BioS 282 or 318. C. Reed, Winter.

332. Morphogenesis in Higher Plants. 3 Hours. Morphogenesis, growth, and differentiation of vascular plants and bryophytes. Emphasis on experimental approaches to plant development at the molecular, cellular, and organismic levels. Lecture. Prerequisite: BioS 232 or 333. Rouffa, Winter.

333. Morphology of Vascular Plants. 5 Hours. Structure, reproduction, and evolutionary history of representative vascular plants, including psilopsids, lycopsids, sphenopsids, ferns, gymnosperms, and angiosperms. Lecture and laboratory. Prerequisite: One year of biological sciences. Eggert, Wilder, Winter.

334. Experimental Phycology. 3 Hours. Survey of major algal groups; particular emphasis on the use of algae as experimental organisms. Prerequisites: BioS 261 or 361 or the equivalent. Bouck, Spring.

335. Laboratory in Experimental Phycology. 2 Hours. Field experience in collecting and identifying common algal forms; practical experience in the use of algae as experimental organisms. May be taken concurrently with Biological Sciences 334. Bouck, Spring.

336. Morphology of Angiosperms. 4 Hours. Basic structure and major features of evolution within flowering plants. Prerequisite: Any one of BioS 201, 232, 319, 325, 333. Wilder, Spring.

337. Morphology of Gymnosperms. 4 Hours. Basic structure and major features of evolution of naked-seeded plants. Prerequisite: Any one of BioS 201, 232, 319, 325, 333, 336. Wilder, Spring.

342. Cytogenetics. 4 Hours. Chromosomal phenomena involved in the mechanics of genetics, structure of genetic material, and the role chromosomal variation plays in the evolution of races and species. Lecture, laboratory, field trips. Prerequisites: BioS 240, 241. Weller, Spring.

343. Population Genetics. 4 Hours. Genetic dynamics for animal, plant, and human populations: mating systems, selection, sampling, and mutation. Lecture and discussion. Prerequisites: BioS 240, 241, Math 130, and credit or concurrent registration in statistics. Spiess, Winter.

344. Experimental Population Genetics. 5 Hours. Experimental and field empirical studies estimating genetic parameters, influence of selection, and other evolutionary forces on genotypes in populations. Lecture, laboratory, and discussion. Prerequisite: BioS 343. Spiess, Spring.

345. Evolution. 4 Hours. Mechanisms of genetic and phenotypic stability and change in populations and species; modes of speciation; rationale for classification systems; nature of taxonomic characters. Prerequisites: One year of biological sciences and BioS 240, 241. Weller.

346. Bacterial Genetics. 3 Hours. The nature of the procaryotic chromosome; mechanisms of genetic exchange, including transformation, transduction, and conjugation; methods of genetic manipulation and analysis; features of bacterial genetics that facilitate molecular analysis of cell function. Lecture. Prerequisites: BioS 241, 250. D. Morrison, Fall.

347. Physiological Genetics. 4 Hours. Consideration of heredity at the biochemical level; particular reference to mutation, the transcription and translation of genetic information, and genetic mechanism. Lecture. Prerequisites: BioS 240, 241, 370. Mego, Winter.

348. Fungal Genetics. 3 Hours. Selected problems in genetics such

as control of the cell division cycle and sexual development, mechanisms of genetic recombination including analyses of meiosis and mitosis and cytoplasmic inheritance; examples drawn from the fungi. Special emphasis on genetics of yeast. Prerequisite: BioS 241. Liebman, Winter.

350. Advanced Microbiology. 4 Hours. Modern contributions to the cellular anatomy, physiology, and genetics of microorganisms. Lecture and discussion. Prerequisite: BioS 250 or 261 or the equivalent. Goldman, Winter.

353. Chemical Biogenesis. 4 Hours. Same as Chemistry 353. Biosynthesis of important biological compounds. Lecture and discussion. Prerequisite: Chem 235.

356. Mycology. 4 Hours. Analysis of the morphology, physiology, and genetics of fungi as related to the taxonomy and phylogeny of fungi. Lecture, laboratory, field trips. Prerequisite: One year of biological sciences. Barclay, Spring.

359. Mammalian Neuroanatomy. 6 Hours. Same as Bioengineering 359 and Information Engineering 359. Introduction to the structure of the mammalian central nervous system. Prerequisites: BioS 280 or 281 or consent of the instructor.

361. Cell Physiology II. 3 Hours. Emphasizes the structure and functional interactions of cell organelles. Organelle development, physiology, and organization are considered particularly in the context of current literature. Prerequisite: BioS 261 or the equivalent. Bouck, Winter.

362. Laboratory in Cell Physiology II. 2 Hours. Practical experience with techniques and analytical methods in cell physiology at an advanced level. An experimental approach is emphasized. Prerequisite: Credit or concurrent registration in BioS 361. Bouck, Winter.

363. Mammalian Physiology I. 5 Hours. The role of the digestive, circulatory, respiratory, and osmoexcretory systems in the maintenance of organismic homeostasis. Emphasis on vertebrates. Lecture, laboratory. Prerequisite: Two years of biological sciences. Nicolette, Webster, Fall.

364. Mammalian Physiology II. 5 Hours. The role of the muscular, sensory, nervous, and endocrine systems in the maintenance of organismic integration. Emphasis on vertebrates. Lecture, laboratory. Prerequisite: Two years of biological sciences. Credit in Biological Sciences 363 is highly recommended. Nicolette, Webster, Winter.

366. Microbial Physiology I. 5 Hours. Organization of physiological processes in various groups of microorganisms; comparative biochemistry of energy-yielding mechanisms; biosynthesis of macromolecules; ecological implications of microbial metabolism. Lecture, discussion, laboratory. Prerequisite: BioS 250 or the equivalent. Shapiro, Winter.

368. Virology. 4 Hours. Nature of viruses and their morphology, chemical composition, assay, host-parasite interactions, and life cycles. Lecture, discussion. Prerequisite: BioS 250 or 261. Witmer, Fall.

370. Biochemistry I. 4 Hours. Same as Chemistry 350. Chemistry of biological systems, including proteins and enzymes. Prerequisites: Chem 119 or 121 and credit or registration in Chem 235. Kassner, Fall.

371. Biochemistry II. 4 Hours. Same as Chemistry 351. Continues Biological Sciences 370. Carbohydrate and lipid metabolism. Electron transport. Prerequisite: BioS 370. L. Anderson, Kassner, Winter.

372. Biochemistry III. 4 Hours. Same as Chemistry 352. Continues Biological Sciences 371. Metabolism of amino acids, nucleic acids, proteins, and the biosynthesis of biological macromolecules. Prerequisite: BioS 371. Shapiro, Witmer, Spring.

376. Circulation Physiology. 4 Hours. Same as Physical Education 325. In-depth discussion of the functional role and control of the heart, blood, major vessels, and microcirculation of the vertebrate body. Prerequisite: BioS 275 or 363.

377. Endocrinology. 5 Hours. Animal hormones in the control of integration, homeostasis, growth, and development. Lecture, laboratory. Prerequisite: BioS 364. Nicolette, Webster, Spring.

380. Ecology Laboratory. 3 Hours. Detailed analyses of population and community assemblages of the Chicago region. Laboratory and required field trips (Saturdays in the fall, Sundays in the spring). Prerequisite: Concurrent registration in BioS 325. Lussenhop, Poulson, Fall, Spring.

381. Environmental Toxicology. 6 Hours. Same as Pharmacognosy

and Pharmacology 381 (School of Public Health). Chemical contamination of air, water, and soil. Health, ecological, and economic aspects of environmental pollutants. Lecture, laboratory, discussion, and field trips. Prerequisite: One course in cell or animal physiology or biochemistry. M. Khan, Fall, Winter.

382. Environmental Conservation. 4 Hours. Applied ecology of the use of renewable natural resources; special emphasis on biotic problems of land, water, and air management; pollution, population increase, multiple-use concept, and land ethics. Lecture, discussion, and term paper. Prerequisite: Credit or concurrent registration in BioS 315 and either 324 or 380. Murray, R.B. Willey, Winter or Spring.

384. Invertebrate Marine Biology I. 5 Hours. Comparative study of structure, development, behavior, classification, and evolution of the annelid-arthropod line of invertebrates; emphasis on parasitism. Lecture, laboratory. Prerequisite: One year of biological sciences. R.B. Willey, Fall.

385. Invertebrate Marine Biology II. 5 Hours. Comparative study of structure, development, classification, and evolution of the radiate and chordate lines of invertebrates; emphasis on colonial specialization. Lecture, laboratory, and research topic. Prerequisite: BioS 384. R.B. Willey, Winter or Spring.

387. General Entomology. 5 Hours. Biology, classification, and functioning of insects; their adaptations and importance. Students planning to enroll should begin collecting insects the previous spring and summer. Lecture, laboratory, field trips. Prerequisite: One year of biological sciences. Greenberg, Fall.

388. Applied Entomology. 5 Hours. Biology, control, and importance of arthropods of economic and public health significance. Lecture, laboratory, field trips. Prerequisite: BioS 387 or the equivalent. Greenberg, Winter.

389. Principles of Protozoology. 5 Hours. Introduction to the comparative morphology, physiology, and systematics of the protozoa, including discussion of advances in major areas of current research. Lecture, laboratory. Prerequisite: One year of biological sciences. Buhse, Spring.

392. Functional and Evolutionary Vertebrate Morphology. 5 Hours. Functional analysis of vertebrate structure and development within an evolutionary framework. Introduction to analytical and experimental techniques in vertebrate morphology, such as biomechanics and high-speed cinematography. Prerequisite: BioS 280. Emerson, Winter.

393. Functional Animal Morphology. 4 Hours. Functional analysis of selected invertebrate and vertebrate organ systems applied to problems of comparative structure, adaptation, and phylogeny. Lecture, laboratory. Prerequisites: Senior standing and consent of the instructor. Emerson, Spring.

395. Biogeography. 3 Hours. Geological and biological factors leading to past and present distribution patterns of animals; emphasis on current experimental methods to elucidate mechanisms of origin and diversification of island and continental faunas. Prerequisite: Senior standing.

396. Comparative Animal Behavior. 4 Hours. Mechanisms of environmental information processing by animals and resulting activity patterns throughout the animal kingdom; emphasis on adaptive behavioral patterns, orientation, and communication. Prerequisite: One advanced course in zoology and animal physiology. Hyatt, R.B. Willey, Winter.

397. Ichthyology and Herpetology. 5 Hours. Ecology, speciation, and adaptive modification of fishes, amphibians, and reptiles as demonstrated from experimental and descriptive studies. Prerequisite: Any one of BioS 218, 240-241, 280, 291. Emerson, Spring.

398. Research Topics in Animal Behavior. 4 Hours. May be repeated once for a total of 8 hours of credit. A maximum of 8 hours of Biological Sciences 398 and/or 291 and/or 299 may be credited toward the undergraduate major requirements in biological sciences. Selected topics in comparative animal behavior. Laboratory, lecture-discussion. Prerequisites: BioS 316 and 396.

Courses for Graduate Students

401. Foundations of Biological Thought. 4 Hours. Presentation and analysis of some of the fundamental concepts of the mainstreams of biological thought. Bond, Murray, Fall.

402. Patterns of Biological Inquiry. 4 Hours. Contemporary and developing ideas in biology, utilizing blocks of integrated research papers to analyze the functioning of selected ideas as they influence the design, execution, and interpretation of research problems. Prerequisite: BioS 401. Bond, Murray, Winter.

403. Inquiry Processes in the Classroom. 4 Hours. The insights derived from Biological Sciences 401 and 402 are used in preparing inquiry-oriented materials for presentation in the classroom. Prerequisite: BioS 402. Bond, Murray, Spring.

404. Practicum in Electron Microscopy. 2 Hours. May be repeated for a maximum of 6 hours of credit. Satisfactory/Unsatisfactory grade only. Supervised practice in tissue preparation and operational procedures in electron microscopy. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

405. Electron Microscopy. 3 Hours. Lectures, demonstration, and discussion of the principles of instrumentation and specimen preparation of biological material for transmission and scanning electron microscopy. Prerequisites: BioS 404 or consent of the instructor. BioS 205 and/or 304 are recommended. R.L. Willey, Spring.

406. Biological Ultrastructure. 4 Hours. Discussion, instrumentation, and special topics in fine structure of plant and animal cells and cell products. Prerequisites: BioS 405. R.L. Willey, Fall.

408. Histochemistry. 5 Hours. Analysis of cell and tissue structure by histochemical methods. Prerequisites: BioS 261, 309, Chem 234, and consent of the instructor. R.L. Willey, Spring.

409. Computer-Based Education for Life Scientists I. 2 Hours. Current hardware, programming language, and lesson materials for teaching college and university biological sciences. Design, evaluation, and development of computer-based teaching modules. Lecture and discussion; use of PLATO IV. Prerequisite: Consent of the instructor. Hyatt.

410. Computer-Based Education for Life Scientists II. 3 Hours. Hands-on laboratory experience with the PLATO IV computer-based education system in student and author modes. Discussion, laboratory. Prerequisites: Consent of the instructor. Hyatt, Winter.

413. Problems in Evolutionary Paleontology. 4 Hours. Same as Geological Sciences 413. Seminar on current problems. Discussion of evidence and mechanisms of change, such as rates of evolution, population structure, and extinction as shown by the vertebrate fossil record. Prerequisite: Consent of the instructor.

420. Advanced Vertebrate Paleontology. 4 Hours. May be repeated twice for credit. Same as Geological Sciences 420. Given as three different courses. Advanced treatment of the functional morphology, paleoecology, and phylogeny of the various vertebrate groups: fishes, amphibians and reptiles, and mammals. Prerequisites: BioS 282, 318.

421. Evolutionary Biology of Plant Populations. 4 Hours. Reproductive systems, demography, coevolutionary relationships, competitive interactions, and community-level interactions unique to plant populations. Prerequisites: BioS 240, 241, and BioS 308 or 315 or 345. Weller, Winter.

422. Physiological Ecology of Plants and Animals. 4 Hours. Physiological investigation of climatic and edaphic differentiation; emphasis on the ecophysiological adaptations of species to their environments. Prerequisites: BioS 315, 324, or 380, and one term of plant physiology. Poulson, Winter.

428. Intermediary Metabolism in Plants. 3 Hours. Pathways of carbon metabolism, enzymes involved, and control mechanisms. Prerequisite: BioS 329 or Chem 351. L. Anderson, Spring.

430. Population Ecology. 3 Hours. The ecology of plant and animal populations. Life histories and population growth, competition, predator-prey systems, population movement, and ecological genetics; emphasis on populational modeling. Prerequisites: BioS 240, 241, 315, 324 or 380, and consent of the instructor. Mertz, Spring.

436. Photobiology. 3 Hours. Biochemical and biophysical mechanism of photobiological processes including vision, photosynthesis, photomorphogenesis, photoperiodism, bioluminescence, and the effects of ultraviolet light on cells. Prerequisite: BioS 372 or consent of the instructor.

437. Organelle Biogenesis. 3 Hours. May be repeated once for credit. Organization, development, and reproduction of plastids and mitochondria, including growth, differentiation, continuity, genetics, and autonomy; origin and evolutionary significance of these organelles. Prerequisites: BioS 261, Chem 351 or the equivalent, and consent of the instructor. Gassman.

440. Seminar on Genetics. 2 Hours. May be repeated for credit. Discussion of research literature in the field. Student topics are assigned. Prerequisites: BioS 240, 241, and consent of the instructor. Staff.

445. Discussion in Systematics and Evolution. 1 Hour. May be repeated for credit. Current literature and recent advances in the field of systematic biology. Prerequisite: Consent of the instructor. Bardack.

446. Developmental Genetics. 4 Hours. Principles of genome function during gametogenesis and the onset of differentiation; patterns and mechanisms of gene regulation in differentiated cells. Prerequisites: BioS 240, 241. Cummings, Fall.

447. The Regulation of Gene Expression. 4 Hours. Analysis of control of gene function at the molecular level; comparison of eucaryotic to procaryotic systems, positive and negative control at the transcriptional level, translational control, allosterism. Prerequisites: BioS 240, 372. Biological Sciences 347 is recommended. Mego, Spring.

448. Chromosome Structure and Function. 4 Hours. Integration of cytological and biochemical information on eukaryotic chromosomes. Regulation of gene expression at the chromosome level. Nucleolar structure and function. Prerequisite: BioS 240. Biological Sciences 361 is recommended. Miller, Spring.

450. Topics in Microbial Physiology. 3 Hours. May be repeated for a maximum of 6 hours of credit. Modern contributions to microbiology, including the ultrastructure of the bacterial cell, metabolism and control mechanisms, bacterial genetics, and cell-viral systems. Lecture. Prerequisite: BioS 350. Goldman.

452. Insect Physiology. 5 Hours. Structure, function, and adaptive aspects of the insect exoskeleton and organ systems; growth, differentiation, and reproduction. Prerequisite: BioS 388. Greenberg, M. Khan, Winter, alternate years.

453. Experimental Entomology. 5 Hours. Techniques in insect organ transplant and ablation, parabiosis, gnotobiotic rearing, monitored feeding. Laboratory and discussion. Prerequisite: BioS 387 or the equivalent. Greenberg. Offered in alternate years.

455. Topics in Molecular Biology. 3 Hours. May be repeated for credit. Selected topics emphasizing molecular studies involved in such diverse areas as virology, genetics, immunology, photobiology, pharmacology, and exobiology. Prerequisites: BioS 240, 241, 250, 261, and consent of the instructor. Staff.

456. Topics in Biochemistry. 2 to 4 Hours. Same as Chemistry 429. May be repeated for a maximum of 16 hours of credit. Selected topics of current interest in biochemistry. Prerequisite: BioS 372 or consent of the instructor.

467. Microbial Membrane Biochemistry. 3 Hours. Structure and function of microbial cell membrane. Current literature on membrane proteins, phospholipid biosynthesis, and macromolecular transport. Lecture. Prerequisites: BioS 250 and any one of BioS 361, 366, 370.

468. Microbial Physiology II. 4 Hours. May be repeated for a total of 8 hours. Biochemistry of growth of microorganisms; formation of various microbial structures; biosynthesis of major cellular constituents; metabolic regulation; kinetics of microbial growth. Lecture, discussion, laboratory. Prerequisite: BioS 366. Shapiro.

469. Enzyme Kinetics. 4 Hours. Same as Chemistry 424. The application of steady state kinetics to the understanding of enzyme action and the mechanisms of biochemical interactions. Prerequisite: Chem 351.

474. Survival of Toxic Environments. 5 Hours. Same as Pharmacognosy and Pharmacology 474 (School of Public Health). Effects of drugs and toxic substances on model vertebrates, including human vertebrates, in terms of the pharmacogenetics of their interaction. Disposition of drugs and toxicants in humans and mechanisms of survival of animals in toxic environments. Lecture, laboratory. Prerequisite: BioS 381 or one course in animal physiology or toxicology. M. Khan.

490. Problems in Vertebrate Morphology. 4 Hours. Feeding and locomotory mechanisms of selected vertebrates. Dissection, experimentation, and seminar presentation of analyzed results. Laboratory and discussion. Prerequisite: BioS 393 or the equivalent.

492. Seminars on Biology. 1 to 3 Hours. Credit varies according to the seminar offered. May be repeated for credit. Selected aspects of biological sciences. Staff.

493. Problems in Modern Biology. 2 to 8 Hours. May be repeated for credit. Not to be used for thesis research. Guided study of selected

topics with research potential in specific fields of advanced modern biology. Prerequisite: Consent of the instructor. Staff.

495. **Graduate Seminar. No Credit.** Thesis presentation by advanced students; occasional seminar by staff and invited speakers. Required of graduate students every term.

499. **Thesis Research. 0 to 16 Hours.** May be repeated for credit. Work in a number of fields offered under the direction of faculty members with appropriate graduate standing. Staff.

BUSINESS ADMINISTRATION

College of Business Administration

Ralph L. Westfall, Dean

Alvin D. Star, Director of Graduate Studies

Tracy A. Tripp, Director, MAS Program in Business Administration

Professors: Elmer Burack, Antonio Camacho, Barry R. Chiswick, E. Eugene Carter, Edwin Cohen, Raymond Coleman (Emeritus), Lucile Derrick (Emeritus), Laurence P. Feldman, Samuel Fox (Emeritus), Brian Gluss, William Grampp, Irvin L. Heckmann, S. George Huneryager, Leonard Kent, Richard F. Kosobud, Carl M. Larson, A.T. Malinosky, Oscar Miller, Chem L. Narayana, George Rosen, Albert J. Schneider (Emeritus), William W. Tongue, Hugh G. Wales (Emeritus), Robert E. Weigand, Ralph L. Westfall

Associate Professors: James R. Adler, Maryann H. Albrecht, Eliezer Ayal, Hale C. Bartlett, Richard Cohn, William J. Dunne, Bert E. Elwert, S. Madonna Kabbes (Emeritus), Ronald E. Jablonski, John F. McDonald, Nicholas A. Michas, Ronald L. Miller, Edward T. Minieka, Albert L. Page, Joseph J. Persky, Ronald Picur, Lalitha Sanathanan, Mary Jane Schlenger, Fayette B. Shaw (Emeritus), Alvin D. Star, Houston H. Stokes, Walter J. Wadycki

Assistant Professors: Jose L. Alberro, Gilbert W. Bassett, Carson Bays, Percy Brill, Andrew A. Brogowicz, Samuel B. Bulmash, Joyce Chen, Carmella U. Chiswick, Paul L. Chouinard, Ronald C. Clute, Gideon Falk, Winifred Geldard (Emeritus), Owen K. Gregory, Michael I. Groner, James E. Hall, Hans G. Heymann, Jacob Hornick, Edward C. Knudson, (Emeritus), Stella B. Machado, James Mensching, Ronald P. Moses, Paul O'Brien, Anthony Pagano, Harry Perros, Alfred V. Robinson, Gary Siegal, Edward L. Suntrup, Eugene Szwajkowski, Mo-Yin Tam, Valavanur Venkutaraman, William D. White, David E. Wildasin, Scott Williamson, Walter J. Woerheide, Akira Yamazaki (Visiting)

The College of Business Administration offers graduate study leading to the Master of Administrative Science in business enterprise administration. Within the college, the Departments of Economics and Quantitative Methods offer the Master of Urban and Quantitative Economics. The Department of Economics also participates in the interdisciplinary PhD program in public policy analysis. Detailed information on these master's and doctoral programs may be found under the appropriate department listing or under the Public Policy Analysis Program.

The Master of Administrative Science program in business enterprise administration contains seven fields of concentration: accounting systems, economics, financial systems, human resource management, management information systems, marketing systems, and policy and administrative practices.

The MAS program has a second major track, Public Agency Administration. Complete information is listed under Public Agency Administration.

Admission Requirements

Applicants are considered for admission on an individual basis. Admission to the MAS program is based on the applicant's previous academic work, GMAT scores, letters of recommendation, statement of educational and professional objectives, and work experience. In order to be considered for admission, an applicant must have a baccalaureate from an accredited college or university with a grade point average of 4.00 (A=5.00) or better for the last 90 quarter hours (60 semester hours) of undergraduate study and score satisfactorily on the Graduate Management Admission Test. A TOEFL score of 550 or above is expected from all applicants whose native language is not English. Transcripts representing all academic work of the applicant must be submitted. Applicants must also arrange to have three letters of recommendation and a statement of educational and professional goals sent to the director of the MAS program in business enterprise administration. Recommendations should be from individuals qualified to comment on an applicant's potential for graduate study in business. Mathematics at least to the level of college algebra or its equivalent is required prior to a student's beginning program course work.

Applicants who have grade point averages of less than 4.00 may be admitted if they can show evidence of substantial promise of their ability to complete the program successfully. This is normally demonstrated through a superior score on the Graduate Management Admission Test. Nondegree applicants are generally discouraged from applying. A nondegree applicant will be considered for admission only when the applicant holds an equivalent master's degree or if special circumstances exist that warrant consideration for admission. Applicants who want to attend on a part-time basis in the day or evening are considered for admission to fall, winter, and spring quarters. Full-time students are accepted primarily in the fall quarter. Candidates in the full-time program take a combination of day and evening course work to complete the program.

Degree Requirements

Graduates of undergraduate business programs accredited by the American Assembly of Collegiate Schools of Business (AACSB) are admitted to the 16-course program for the MAS in business administration. All other candidates must complete the 24-course program degree. Students in the 16- and 24-course programs must complete a minimum of 9 courses (36 hours) at the 400 level in the course work beyond the required core. At least 12 courses (48 hours) must be taken in residence at the University of Illinois at Chicago Circle for the Master of Administrative Science. A thesis is not required.

Transfer and Proficiency Credit. Students in the 24-course program may have up to 12 courses (48 hours) of required courses accepted for transfer or completed through proficiency examination for credit. Students in the 16-course program may have 4 courses (12 hours) completed through transfer or proficiency examination for credit. Transfer credit is only granted for course work taken in an AACSB-accredited graduate program. Transfer and proficiency credit are not given for Management 480—Strategy and Action Planning; Complex Enterprise Simulation and Management 490—Seminar in Policy.

Course Requirements. 16- and 24-course program students must satisfy the following required and elective course requirements. The curriculum for the 16-course program student consists of five required courses and eleven electives. Students in the 24-course program follow a curriculum of four-

teen required courses and ten elective courses. The elective area for both programs is broken down into two categories: (1) concentration courses and (2) approved free elective courses. Each student is required to complete two fields of concentration of three courses each within the elective course work.

Business Administration/MAS

I. Required Courses

14 courses (56 hours). Mathematics at least to the level of college algebra or its equivalent is required prior to a student's beginning program course work. Students in the 16-course program are required to complete only those courses* indicated below.

- Accounting 400—Managerial Accounting I
- *Economics 401—Microeconomics
- Economics 411—Macroeconomics
- Finance 412—Financial Management
- Management 440—Organizational Theory
- *Management 441—Organizational Behavior
- Management 455—Operations and Systems Management
- *Management 480—Strategy and Action Planning¹
- Management 490—Seminar in Policy Formulation, Implementation, and Evaluation¹
- Marketing 400—Client/Consumer Behavior, Communication, and Organizational Strategy
- Marketing 470—Social and Legal Environment of the Firm
- Quantitative Methods 470—Mathematical Methods I
- *Quantitative Methods 471—Mathematical Methods II
- *Quantitative Methods 472—Statistics: Theory and Application

II. Electives

The elective area is broken down into two categories: (1) concentration course work and (2) approved free electives. All students are required to complete two fields of concentration of three courses each.

A. Concentrations

1. *Accounting Systems.* Accounting 401—Managerial Accounting II; Accounting 402—Financial Accounting I; Accounting 406—Financial Planning and Control.

2. *Economics.* It is strongly recommended that students select at least two courses from one of the following subspecializations:

(a) *Business Research and Forecasting.* Economics 425—Business Conditions Analysis; Economics 434—Econometrics I; Economics 435—Advanced Econometrics; Economics 436—Advanced Mathematical Economics; Economics 437—Business Research and Forecasting.

(b) *Managerial Economics and Industrial Organization.* Economics 400—Managerial Economics; Economics 425—Business Conditions Analysis; Economics 460—Industrial Organization.

(c) *Applied Macro and International Economics and Development.* Economics 412—Macroeconomics II; Economics 413—Monetary and Fiscal Policy; Economics 414—International Trade Policy; Economics 415—International Monetary Policy; Economics 474—Comparative Urbanization.

(d) *Urban and Human Resource Economics.* Economics 451—Economics of Education; Economics 471—Advanced Urban Economics I; Economics 472—Advanced Urban Economics II; Economics 473—Urban Labor Markets; Economics 474—Comparative Urbanization.

(e) *Public Finance.* Economics 475—Economic Analysis of Public Expenditures; Economics 476—Economics of Taxation; Economics 451—Economics of Education and In-

come Distribution; Economics* 403—Non-Market Decision-Making.

3. *Financial Systems.* Finance 440—Advanced Financial Management; Finance 452—Multinational Financial Management; Finance 460—Investments.

4. *Human Resource Management.*

(a) Required: Management 453—Manpower Administration; Management 454—Collective Bargaining and Managerial Processes.

(b) Choose at least one of the following: Economics 331—Labor Economics; Management 363—Collective Bargaining; Management 465—Manpower Planning and Development; Sociology 344—Industrial Sociology; Psychology 332—Personnel Psychology.

5. *Management Information Systems.* Quantitative Methods 401—Business Oriented Programming Languages,* Quantitative Methods 435—Management Information Systems; Quantitative Methods 437—Administrative Computer Technology.

*Students may place out of QM 401; these students would be allowed to select from the group-related electives described under MIS.

6. *Marketing Systems.*

(a) Required: Marketing 460—Marketing Management.

7. *Policy and Administrative Practices.*

(a) Required: Management 361—Comparative Study of Organizations.

(b) Choose at least two of the following: Management 481—Administrative Structure and Organization Design; Management 368—Management Information Systems; Psychology 330—Organizational Psychology; Sociology 347—Sociology of Complex Organizations; Urban Planning and Policy 435—Development and Implementation of Social Planning and Policies.

B. Approved Free Electives

Students in the 16- and 24-course program have five and four free electives respectively. Up to 50 percent of the approved free electives may be taken in each of a student's two fields of concentration. Students may select electives from any of the courses listed in the concentrations or College of Business Administration graduate courses not used elsewhere in the required curriculum. Elective courses are also available for selection from colleges and schools on either of the Chicago campuses of the University of Illinois, subject to the approval of the director of the MAS program in business enterprise administration.

ACCOUNTING

The accounting systems concentration is intended to acquaint the student with the theory and practical applications of financial and managerial accounting. Not only will the development of accounting records and financial statements be covered but their uses will also be emphasized. Three specific courses in accounting (12 quarter hours) are required in addition to Accounting 400 (AACSB graduates should not take Accounting 400 unless it is specifically approved by the program director). The course requirements listed below fulfill the requirements in business enterprise administration. Other accounting courses should be taken, only with the approval of the director of the MAS program in business enterprise administration. Any elective not listed as part of a designated area of concentration also requires approval.

1. No waiver through proficiency examination for credit or transfer credit is available.

Required courses: Accounting 402—Financial Accounting I; Accounting 406—Financial Planning and Control

Courses for Graduate and Advanced Undergraduate Students

311. Accounting Theory I. 4 Hours. Development and applications as related to financial statements, valuation of assets, and measurements of income. Prerequisites: Actg 111 and declaration of a major.

312. Accounting Theory II. 4 Hours. Development and applications as related to financial statements, liabilities, owner's equity, and measurement of income. Special topics include price level changes and accounting changes. Prerequisites: Actg 311 and declaration of a major.

313. Accounting Theory III. 4 Hours. Development and applications as related to investments, business combinations, foreign exchange, and fund accounting. Special topics include earnings per share and the statement of changes in financial position. Prerequisites: Actg 312 and declaration of a major.

320. Managerial Cost Analysis. 4 Hours. Analysis of costs for decision-making, planning, and control; standards and budgets as a guide to measuring and controlling performance; costing systems for various purposes. Prerequisites: Actg 312 and declaration of a major.

325. Computer Accounting. 4 Hours. Aspects of computer systems designed to perform accounting functions. Topics include programming, file construction, data retrieval, and controls. Prerequisites: Credit or concurrent registration in Actg 330 and declaration of a major.

330. Auditing. 4 Hours. History, function, and theory; nature of necessary evidence for the accountant's professional opinion concerning the financial position and the results of enterprise operations; applications of statistical sampling; auditing computerized systems. Prerequisites: Actg 313, 320, and declaration of a major.

331. Advanced Auditing. 4 Hours. Audit factors affecting the nature of evidential matter, the performance of audit procedures, and the auditor's report; special problems in reporting; recent pronouncement of the Auditing Standards Executive Committee. Advanced development of basic concepts introduced in Accounting 330. Prerequisites: Actg 330 and declaration of a major.

340. Federal Income Tax. 4 Hours. Concepts of federal income tax; its effects on decisions of corporations, partnerships, individuals, and trusts. Prerequisites: Actg 313 and declaration of a major.

341. Advanced Federal Income Tax. 4 Hours. Tax factors affecting business decisions of corporations and partnerships; special problems in reorganizations, liquidations, and personal holding companies. Advanced development of basic concepts discussed in Accounting 340. Prerequisites: Actg 340 and declaration of a major.

342. Estate, Gift, and Trust Taxation. 4 Hours. Internal Revenue Code treatment of estate, gift, and trust entities; some legal principles necessary to comprehend tax planning. Prerequisites: Actg 341 and declaration of major.

350. Business Law I. 4 Hours. Fundamental rules of law applicable to business activity. Contract and agency; the nature and formation of contractual obligations; sales of personal property; commercial paper under the Uniform Commercial Code. Prerequisites: Junior standing and declaration of a major.

351. Business Law II. 4 Hours. Business units through which business is conducted and the legal rules governing formation, operation, and dissolution of partnerships and corporations. Basic rules of real property law, insurance and bankruptcy, bailments, and carriers. Accountants' legal liability. Restraint of trade. Prerequisites: Actg 350 and declaration of a major.

360. Accounting for Nonprofit Organizations. 4 Hours. Special accounting problems and techniques associated with private and public nonprofit organizations. Prerequisites: Actg 313, 320, and declaration of a major.

380. International Accounting. 4 Hours. An advanced course. Pertinent areas of accounting from a multinational viewpoint. Four specific areas covered are financial accounting for international operations, multinational managerial accounting and control, comparative international accounting principles, and international financial reporting. Prerequisites: Actg 313, 320, and declaration of a major.

390. Special Topics in Accounting. 4 Hours. Selected topics in various fields, including public accounting, managerial accounting, and tax accounting. Selected readings from professional and academic journals and cases for analysis. Prerequisites: Actg 313, 320, and declaration of a major.

399. Independent Study in Accounting. 4 Hours. Advanced independent study in approved topics. A written report prepared under the guidance of a faculty member is required. Prerequisites: Actg 313, 320, declaration of a major, and approval of the department.

Courses for Graduate Students

400. Managerial Accounting I. 4 Hours. Basic concepts and tools of analysis necessary for the quantification, recording, and communication of financial events. Prerequisite: Admission to the MAS program.

401. Managerial Accounting II. 4 Hours. Accounting methods applicable to the determination and analysis of financial data relevant to managerial decision problems. Topics include cost behavior, budgeting for planning and control, cost allocation, cost accounting systems, and capital budgeting. Prerequisite: Actg 400.

402. Financial Accounting I. 4 Hours. Formulation of a conceptual model of accounting valuation and its implications for accounting practice; accounting valuation methods applied to assets and equities and their relationship to the conceptual model; concepts and criteria underlying income determination. Prerequisite: Actg 401.

403. Financial Accounting II. 4 Hours. Accounting procedures applicable to the formation, expansion, and dissolution of different business entities, such as partnerships, corporations, trusts, and estates; emphasis on accounting for the corporate entity. Prerequisite: Actg 402.

406. Financial Planning and Control. 4 Hours. The uses of financial information for decision-making and control; the role of the accounting system and corporate controller in developing and refining the data necessary for cost and managerial planning. Prerequisite: Actg 401.

ECONOMICS

The economics specialization is designed to acquaint the student with the tools of theoretical and applied economics analysis. Students should select a program of study with the approval of the director of the MAS program in business enterprise administration. Courses are listed separately under Economics.

Required courses: Students taking the economics concentration in the MAS program must take at least three 400-level economics courses in addition to the MAS core courses: Economics 401 and Economics 411. It is strongly recommended that students select at least two courses from one of the following subspecializations:

(1) *Business Research and Forecasting.* Economics 425—Business Conditions Analysis; Economics 434—Econometrics I; Economics 435—Advanced Econometrics; Economics 436—Advanced Mathematical Economics; Economics 437—Business Research and Forecasting.

(2) *Managerial Economics and Industrial Organization.* Economics 400—Managerial Economics; Economics 425—Business Conditions Analysis; Economics 460—Industrial Organization.

(3) *Applied Macro and International Economics and Development.* Economics 412—Macroeconomics II; Economics 413—Monetary and Fiscal Policy; Economics 414—International Trade Policy; Economics 415—International Monetary Policy; Economics 474—Comparative Urbanization.

(4) *Urban and Human Resource Economics.* Economics 451—Economics of Education; Economics 471—Advanced Urban Economics I; Economics 472—Advanced Urban Economics II; Economics 473—Urban Labor Markets; Economics 474—Comparative Urbanization.

(5) *Public Finance*. Economics 475—Economic Analysis of Public Expenditures; Economics 476—Economics of Taxation; Economics 451—Economics of Education and Income Distribution; Economics 403—Non-Market Decision-Making.

FINANCE

The specialization in financial systems is designed for students desiring skill in handling general problems in finance as well as for those planning for careers in financial areas. The courses stress techniques of analyzing financial markets, evaluating capital projects, managing working capital, and investing funds.

A background in mathematics and quantitative methods, managerial accounting, and economics is useful in developing skills in finance. Since financial skills can be applied to a broad range of activities, students in this skill area should use their electives as much as possible to broaden their understanding of the various aspects and functions of enterprise operations. Electives not listed in a designated area of concentration require the approval of the director of the MAS program in business enterprise administration.

Required courses: Finance 440—Advanced Financial Management; Finance 452—Multinational Financial Management; Finance 460—Investments;

Courses for Graduate and Advanced Undergraduate Students

351. Investments. 4 Hours. Types and distinguishing features of securities, security markets, analysis of financial statements and principles of valuation, quality differences, selection of securities to meet varying personal and institutional objectives. Prerequisites: Fin 250 and 360. Business administration students must have declared a major.

352. Investment Policy. 4 Hours. Varying strategies to meet diverse objectives; investments for individuals, business firms, banks, insurance companies, pension and profit-sharing funds; interrelation of investment policies and the economic environment. Prerequisite: Fin 351. Business administration students must have declared a major.

353. Problems in Business Finance. 4 Hours. Selected areas in advanced corporate finance, including short-term asset management; capital budgeting under certainty and uncertainty; capital structure and dividend policy and theory; valuation and risk; the structure of capital asset prices and implications of that structure for financial policy of firms. Prerequisite: Fin 250. Business administration students must have declared a major.

354. Security Analysis. 4 Hours. Interpretation and analysis of published financial statements for internal control and external evaluation. The financial characteristics of industrial, commercial, financial, transportation, public utility, real estate, and nonprofit institutions. Prerequisite: Fin 351. Business administration students must have declared a major.

355. Real Estate Finance. 4 Hours. Introduction to real estate investment decision-making and the execution of those decisions in an urban environment. Effects of the urban environment on the real estate investment decision process and the impact of real estate investments on the cities. Government real estate policies, taxes, sources of funds, and conditions in the financial markets. Prerequisite: Fin 250. Business administration students must have declared a major.

360. Money and Banking. 4 Hours. Monetary and banking systems. The Federal Reserve System; monetary theory; international monetary relations; monetary policy in the United States. Prerequisites: Junior standing and Econ 121. Business administration students must have declared a major.

361. Theory and Structure of Financial Markets. 4 Hours. Consumption, saving, and the allocation of resources over time. Financial intermediation and the role of financial markets in allocating funds, absorbing risk, and providing liquidity. Financial institutions, relationship among markets, competition, and public policy. Prerequisite: Fin 360. Business administration students must have declared a major.

362. Financial Management of Commercial Banks. 4 Hours. An in-depth study, including an analysis of liquidity, asset, and liability management. Various methods of evaluating loans and the profitability and costs of various bank operations. Prerequisites: Fin 250, 360; QM 172 or consent of the instructor. Business administration students must have declared a major. Tongue, Winter.

371. Multinational Financial Management. 4 Hours. The international financial system and the application of the basic principles of business finance in an international context. Topics include the international monetary system, motives for and forms of direct foreign investment, political risk, exchange risk and hedging techniques, sources of funds, and policies with respect to asset management and taxation. Prerequisites: Fin 250, Econ 121. Business administration students must have declared a major.

372. Financial Management in the Nonprofit Sector. 4 Hours. Description, goals, and optimal financial policy in the private and public nonprofit sectors of the economy. Cost-benefit analysis, the social opportunity cost of public funds, and illustrative applications. Prerequisites: Fin 250, Econ 319 or 321. Business administration students must have declared a major.

373. Small Business Finance. 4 Hours. Aspects of acquiring funds that are uniquely associated with small business enterprises. Topics include the trade-off of liquidity and nonprofitability, management and working capital, and capitalization. Prerequisite: Fin 250. Business administration students must have declared a major.

380. Corporate Financial Strategy. 4 Hours. Economic and legal factors; market dominance, oligopolistic markets, antitrust policy; organizational and behavioral factors in decision-making; learning theory; the nature of managerial leadership; and the impact of information systems and accounting policy on financial decision-making. Prerequisites: Fin 351, 353.

399. Independent Study. 2 to 4 Hours. May be repeated once for credit. For students in good standing in the College of Business Administration who wish to pursue advanced study in topics related to finance. A written report is required. Prerequisites: 16 hours of upper-division finance and consent of a faculty member and the head of the department.

Courses for Graduate Students

412. Financial Management. 4 Hours. Investment and financial decisions, particularly as related to the economic environment under conditions of uncertainty. Topics include capital budgeting, portfolio analysis, cost-benefit analysis, financial markets, capital structures, and financial planning and analysis. Prerequisites: Actg 411, Econ 401.

440. Advanced Financial Management. 4 Hours. In-depth study of financial analysis, including ratios, sources and uses of funds, and determination of cash flows; theory and cases in capital budgeting under uncertainty, with special attention to cost-benefit analysis; cost of capital, including analysis of the term structure of interest rates and factors affecting financial markets. Prerequisite: Fin 412.

452. Multinational Financial Management. 4 Hours. Financial management within an international context. International monetary system, international financial markets, management policies with respect to foreign investments, working capital management, exchange risks, taxation and reporting of earnings. Prerequisite: Fin 412.

460. Investment. 4 Hours. The principles and practice of investment analysis and management with special attention to the investment environment and the criteria for investment decision-making under conditions of uncertainty. Prerequisite: Fin 412.

461. Security Analysis. 4 Hours. Analytical techniques applied to financial statements of industrial, utility, and transportation companies; financial institutions; and investment companies. Special attention to the relevance of security analysis in the framework provided by the efficient market hypothesis. Prerequisite: Fin 412.

462. Theory and Structure of Options and Futures Markets. 4 Hours. Contemporary financial analysis of option and futures markets. Arbitrage, hedging, and speculation as tools applied by financial and production managers to daily operations of domestic and multinational corporations. Systematic analysis of mechanism used to set the prices for the future delivery of commodities, common stock, and types of bonds. Prerequisite: Fin 412.

464. Real Estate Finance. 4 Hours. Analyzes the market for real estate with emphasis on the variables affecting its market price. Institutional framework of the real estate market; exposition of its participants including developers, speculators, financial institutions and consumers. Government regulation, land planning, zoning and urban development models. Government programs such as VA, FHA, and GNMA. Prerequisite: Fin 412.

470. Money and Banking. 4 Hours. The functions and nature of money; monetary standards; development and operation of commercial banking and the Federal Reserve System. Theories of the supply and demand for money; the effects of monetary changes on economic activity, interest rates, prices, and income. Inflation. Monetary policy. Prerequisite: Econ 320 or the equivalent.

471. Financial Management of Bank. 4 Hours. Asset and capital management of commercial banks. Profit analysis of bank activities such as deposit acquisition, loan management, and international operations. Prerequisite: Fin 412.

472. Capital Market. 4 Hours. Capital markets in the private economy. The flow of funds in financial markets. Financial intermediaries. The pricing of securities. Short-term money markets and the Federal Reserve System. The market for long-term securities. Financial markets and the stability and progress of the economy. Prerequisite: Fin 412.

480. Corporate Financial Strategy. 4 Hours. Topics include economic and legal factors (market dominance, oligopolistic markets, antitrust policy); organizational and behavioral factors in decision-making; learning theory; the nature of managerial leadership; and the impact of legal, taxation and accounting policy on financial decision-making.

MANAGEMENT

The department offers two separate areas of concentration for the business enterprise administration specialization of the MAS program.

Human resource management encompasses the study of personnel administration and union-management relations. Course work in this area prepares individuals for staff positions in personnel or employee relations departments and provides employee management knowledge for supervisors. Students who are interested in this area should also consider appropriate courses offered by the economics, psychology and sociology departments. Courses in this area are generally non-quantitative and are human relations skills oriented. Increasingly, professionals who work in this area should be knowledgeable in administrative law and government regulatory agency processes. Electives not listed in a designated area of concentration require the approval of the MAS program in business enterprise administration.

Required Courses;

(1) Required: Management 453—Manpower Administration; Management 454—Collective Bargaining and Managerial Processes

(2) Choose at least one of the following: Economics 331—Labor Economics; Management 363—Collective Bargaining; Management 465—Manpower Planning and Development; Sociology 344—Industrial Sociology; Psychology 332—Personnel Psychology

Policy and administrative practices is a generalist area concerned with such topics as: planning, policy formulation, organization design, management of change, decision-making, and strategy. Study in this area prepares individuals for managerial careers in private and nonprofit organizations.

Courses in such topics as management information systems, budgeting and control, and industrial organization are useful supplements. Students should be able to assimilate behavioral and systems management material effectively. Electives not listed in a designated skill area must be approved by the director of the MAS program in business enterprise administration.

Required courses;

(1) Required: Management 361—Comparative Study of Organizations

(2) Choose at least two of the following: Management 481—Administrative Structure and Organization Design; Management 368—Management Information Systems; Psychology 330—Organizational Psychology; Sociology 347—Sociology of Complex Organizations; Urban Planning and Policy 435—Development and Implementation of Social Planning and Policies

Courses for Graduate and Advanced Undergraduate Students

330. Organizational Psychology. 4 Hours. Same as Psychology 330. Individual psychological and group processes and their interaction with organizational structure. Behavioral factors in effective organizational change. Prerequisite: Graduate standing or Psch 243, one course in social psychology or industrial psychology, and consent of the instructor.

333. Motivation and Morale in Industry. 4 Hours. Same as Psychology 333. Concepts and methods in the assessment and modification of employee motivation, attitudes, and morale. Prerequisite: Graduate standing or 12 hours of psychology, including Psch 332 or the equivalent.

338. Psychology of Industrial Conflict. 4 Hours. Same as Psychology 338. Behavioral analysis of the causes, dimensions, and modes of resolution of industrial conflict; special emphasis on labor-management relations. Prerequisite: Graduate standing or Mgmt 330 or the equivalent.

344. Industrial Sociology. 4 Hours. Same as Sociology 344. Analysis of industrial institutions in contemporary society; management, labor, and the community. Prerequisite: 8 hours of sociology.

345. Organization Theory II. 4 Hours. An analytical, in-depth study of organizational theories, their development of empirical evidence for organization development practices, and their implications for management. Prerequisite: Mgmt 340.

347. Sociology of Complex Organizations. 4 Hours. Same as Sociology 347. Characteristics of business, government agencies, schools, hospitals, and other large-scale organizations; approaches used to study organizations; theoretical and empirical analysis of organizational processes. Prerequisites: 8 hours of upper-division management, political science, or sociology, or consent of the instructor.

352. Organization Behavior. 4 Hours. Executive and manager behavior in working organizations. Analysis of human problems and relationships at work. Leadership styles, problems of motivation and attitudes. Emphasis on behavioral sciences theory and technology as applied to business. Case method of analysis and study. Prerequisite: Mgmt 240. Business administration students must have declared a major.

353. Manpower Management. 4 Hours. The subsystems of manpower planning, recruitment and selection, training and development, position control, audit and evaluation, and salary and benefit administration that constitute the manpower function of all organizations. Emphasis on the role of these activities as services and support-control systems. Prerequisite: Junior standing. Business administration students must have declared a major.

354. Union-Management Relations. 4 Hours. Analysis of union impact on the management of organizations, including structures and functions of unions, collective bargaining as a decision-making process, government regulation of union-management relations, public policy issues, and alternative union-management relations systems. Prerequisite: Junior standing. Business administration students must have declared a major.

- 356. Operations and Systems Management II. 4 Hours.** Application of management sciences to operations and control of operational systems. Emphasis on systems operations facilities, systems standards and information flow, system maintenance, and the behavioral interface and system control. Prerequisite: Mgmt 255 or the equivalent. Business administration students must have declared a major.
- 357. Operations and Systems Management III. 4 Hours.** Emerging concepts in management science. Managerial applications of computer technology and utilization and related electronic data processing. Applications of quantitative methods to information and control methods and systems. Process and systems design. Prerequisite: Mgmt 356.
- 359. Business Policy. 4 Hours.** No credit in the Master of Administrative Science Program. The formulation and implementation of policies that determine the long-term character and performance of business firms. Problems in policy are analyzed from the vantage point of top management rather than from the limited view of a functional specialist. Through written analysis, classroom discussion of cases, and experience in management simulation, the students are exposed to a wide variety of top management problems. The topics and cases covered are also appropriate for students interested in the management of public institutions. Prerequisites: Completion of core requirements in the College of Business Administration; students must be within two terms of graduation.
- 360. Business, Society, and Technology. 4 Hours.** Business and the corporate role in a complex, technological society. Emphasis on the historical evolution of business; the many relationships of the corporation to its external environment; urban problems of business; the impact of the corporation on individual and group behavior. Prerequisite: Mgmt 240. Business administration students must have declared a major.
- 361. Comparative Study of Organizations. 4 Hours.** The significant differences in organizations; the importance of these differences for the operation, management, and design of organizations. Prerequisite: Mgmt 240. Business administration students must have declared a major.
- 362. American Labor Movement. 4 Hours.** Theories, structures, and functions of the American labor movement within economic, social, and political systems. Prerequisite: Junior standing.
- 363. Collective Bargaining. 4 Hours.** Intensive examination of the structure and conduct of collective bargaining; the determination of the bargaining unit and bargaining representative; the negotiation and scope of contracts; the administration of contracts; the major substantive issues in negotiations; the procedures for resolving industrial conflict. Prerequisites: Mgmt 353, 354.
- 364. Labor Law and National Labor Policy. 4 Hours.** The evolution of national labor policy considered within a framework of labor legislation, court decisions, and administrative rules. Problems of effectuating labor agreements; problems of protecting individual employee rights in a collective bargaining context. Introduction to the legal and constitutional problems of government regulation of industrial and labor relations. Prerequisite: Mgmt 354.
- 365. Compensation Systems. 4 Hours.** Lecture and discussion of current compensation issues and problems. Topics include the psychology of money motivation, the current status of wage and salary administration, wage criteria, methods and techniques of job evaluation and job analysis, determination of pay grades and ranges, employee benefits and services, employee incentives, and special compensation issues. Prerequisite: Mgmt 353 or 354. Business administration students must have declared a major.
- 367. Impact of Technological Change. 4 Hours.** The impact of technological change on the business environment and the managerial process; emphasis on alternative futures and planning to attain desired ends. Prerequisite: Mgmt 255.
- 368. Management Information Systems. 4 Hours.** Design, operation, and control of managerial information systems; problems of system documentation, data management, programming management, and integration of real-time computer-based systems to system simulation and managerial research. Prerequisite: Mgmt 255 or graduate standing.
- 371. Management and Organization Development. 4 Hours.** Alternative strategies and methods for developing and increasing the creativity, flexibility, and productivity of the organization and its management personnel. Topics include the role of manpower

development and structure in the organization's long-range plan, the role of interventionists, management consultants and centralized training and development departments, the systems view and the development function, traditional and contemporary development philosophies and techniques, criteria selection and evaluative research, and the framework for successful organization development and change. Readings, examples, and case studies from the public and private sectors. Prerequisite: Mgmt 240. Business administration students must have declared a major.

373. Collective Bargaining in Public Employment. 4 Hours. Practices and legislation pertaining to union-management relations at the federal, state, and local levels of government. Procedural and policy issues confronting public employees, union officials, and government administrators. Prerequisite: Mgmt 354. Business administration students must have declared a major.

374. Comparative Industrial Relations Systems. 4 Hours. Analysis of industrial relations structures, problems, and experiences in selected countries. Common and contrasting features of industrial relations systems are related to national economic, political, and social characteristics. The implication for management and economic development of differences among industrial relations systems. Prerequisite: Mgmt 354.

380. Transportation Systems Management. 4 Hours. Problems and practices, including the impact of public policy, capital facilities, industry structure, operations pricing, and environmental relationships. Prerequisites: Econ 120, 121, Mgmt 255. Business administration students must have declared a major.

381. Managerial Logistics. 4 Hours. The management of all activities governing the physical flow of raw materials and finished goods through stages of production to points of final consumption. Key areas include design of logistics systems, transportation location theory, inventory control, and the use of mathematical techniques in solving problems of logistics management. A logistics system computer simulation game is used. Prerequisites: Econ 219 or 220, Mgmt 255. Business administration students must have declared a major.

382. Urban Mass Transportation Systems Management. 4 Hours. Managerial, economic, and environmental aspects, including development of urban transit, federal role in financing urban transit, labor relations, pollution and social benefits, marketing urban transit, congestion, peaking problems, and unique management problems. Prerequisites: Mgmt 240, 255. Business administration students must have declared a major.

383. Transportation and Public Policy. 4 Hours. Same as Economics 383. The relationship between government and transportation in the United States. Topics include the evolution of transport policy, problems in transport regulation, and current issues in public policy. Prerequisite: Mgmt 380. Business administration students must have declared a major.

390. Special Topics in Management. 4 Hours. Exploration of an area not covered in existing course offerings; or study in greater depth, or at a more advanced level, of a problem or subject covered in an existing course. Subject matter varies from term to term. Prerequisites: Senior standing, 15 hours of 300-level management courses, and consent of the instructor. Business administration students must have declared a major.

399. Independent Study. 2 to 4 Hours. May be repeated once for credit. Advanced independent study in approved topics related to management. A written report prepared under the guidance of a major professor is required. Prerequisites: 16 hours of upper-division management courses and consent of the head of the department. Business administration students must have declared a major.

Courses for Graduate Students

440. Organization Theory. 4 Hours. Classical and modern theories of organization. Organization structure, processes of organization, line and staff relationships, management controls, formal and informal organization, bureaucracy, leadership, and management functions. Case analysis. Prerequisite: MAS student.

441. Organizational Behavior. 4 Hours. The organization as a social system. Behavioral concepts with administrative applications. Topics include leadership behavior and styles, interpersonal effectiveness, group behavior, managing change, conflict management, motivation and behavior, and interpersonal communications. Prerequisite: Mgmt 440.

451. Organization Theory. 3 to 4 Hours. Classical and modern theories of organization. Organization structure and processes, line and staff relationships, management controls, managerial decision-making, organizational objectives and restraints, management functions, formal and informal organization, bureaucracy, and behavioral sciences concepts. Prerequisite: Mgmt 350.

452. Administrative Practices. 3 to 4 Hours. Analysis of human problems in management and organization. Dynamics of leadership in the working organization, group dynamics, administrative behavioral patterns, administrative implications of decision-making and policy formulation, and other relevant behavioral sciences concepts. Prerequisite: Mgmt 440.

453. Manpower Management and Applied Behavioral Science. 4 Hours. Manpower management programs and policies. Staffing, training and development, historical evolution of personnel policies, modern labor force and technological trends, supervision, wage and salary administration, and manpower research and utilization. Prerequisites: Mgmt 240 or the equivalent, Mgmt 440.

454. Collective Bargaining and Managerial Processes. 4 Hours. Structure and conduct of collective bargaining and the effects of collective representation upon the managerial function in public, private and nonprofit institutions. Specific topics include: organizing and recognition, contract negotiation, contract administration, strikes and strike substitute procedures, and the linkage of collective bargaining and political processes. Prerequisites: Mgmt 440 and 441 or their equivalent.

455. Operations and Systems Management. 4 Hours. Basic principles and procedures for effective utilization of productive factors in a working organization. Facilities design, control systems, data processing, scheduling, automation, statistical analysis, computer technology, production planning, process design, and other relevant management science concepts. Prerequisites: QM 470, 471.

457. Seminar on International Business. 4 Hours. Management practices and problems in major nations. Legal and cultural factors affecting managerial policies and decisions; organization planning and manpower utilization; comparative management systems and ideologies. Prerequisite: Mgmt 440.

458. Seminar on Business Policy and Decision Theory. 4 Hours. To be taken in the final term of the student's degree program. A capstone course to integrate all the functional areas of business: policy formulation and administration, policy and decision implementation, long-range planning, control techniques, factor analysis and decision-making in an uncertain environment, quantitative techniques, simulation and case exercises, and study of actual business firms.

459. Business and Society. 4 Hours. Historical background of American business systems and institutions; conflicts between business and economic groups; problems of social groups seeking specified goals in a pluralistic society. Prerequisite: Mgmt 440.

465. Manpower Planning and Development. 4 Hours. Analysis of the manpower planning and human resource development functions necessary in all working organizations. Topics include manpower planning models, appraisal systems, assessment centers, training and development theories and methodology, public policy on selected management issues, and career development and planning programs.

471. Characteristics of Nonprofit Corporations. 4 Hours. Analysis of the organization and administration of nonprofit corporations. Comparative analysis with private and public sector institutions. Diverse uses of this form of organization, such as health institutions, colleges and universities, research facilities, charities, and museums. Problems related to financing, measuring, and evaluating performance, tax status, and policy formulation.

MARKETING

The marketing systems area of concentration must consist of at least three courses as listed below. This skill area is intended to prepare the student to interact with or to work within a marketing department or firm specializing in marketing. Courses not listed within designated areas of concentration may be taken as electives only with the approval of the director of MAS program in business enterprise administration.

Required courses:

- (1) Required: Marketing 460—Marketing Management
- (2) Choose at least two of the following: Marketing 461—Consumer Behavior; Marketing 463—Information for Market Decision; Marketing 465—Marketing Communication and Promotional Strategy; Marketing 471—International Marketing

Courses for Graduate and Advanced Undergraduate Students

352. Principles of Retailing. 4 Hours. Theory and practice in the making of retailing decisions; merchandising policies, buying policies and activities; pricing policies and practices, promotional policies, credit policies and practices. Prerequisite: Mktg. 260.

361. Consumer Market Behavior. 4 Hours. Motivations underlying market behavior of consumers, producers, middlemen; drives, emotions, desires, learning, memory; effects of demographic characteristics, social status, and reference groups on marketing action. Prerequisite: Mktg 260. Business administration students must have declared a major.

362. Marketing Research and Information Systems. 4 Hours. The gathering and interpretation of information used in solving marketing problems; pertinent modern research techniques from mathematics and the behavioral sciences are employed in developing an analytical structure. Prerequisites: Mktg 361, QM 272 or the equivalents. Business administration students must have declared a major.

363. Marketing Channels. 4 Hours. Principles underlying the development of an integrated distribution system; its relationship to the marketing structure of the firm; evaluation of decisions on raw material sources, plant and warehouse location, wholesale and retail outlets; analysis of the movement of products through marketing channels. Prerequisites: Mktg 250, 260. Business administration students must have declared a major.

365. Marketing Management. 4 Hours. Seminar. Building marketing programs to implement the achievement of marketing objectives. Individual and group research and presentation from the viewpoint of major marketing executives of the firm; business case analysis. Prerequisite: 20 hours of marketing. Business administration students must have declared a major.

366. Comparative Marketing Systems. 4 Hours. An advanced course. The structures and processes of domestic marketing systems in other countries in a framework of comparative cultural, political, economic, and social systems. Prerequisite: Mktg 260. Business administration students must have declared a major.

367. Management Science in Marketing. 4 Hours. Introduction to management science concepts and techniques used in the analysis and solution of marketing management problems in areas of advertising, pricing, product planning, personal selling, and distribution through the study of actual applications. Prerequisites: Mktg 260, QM 172. Business administration students must have declared a major.

368. Problems in Marketing Research and Information Systems. 4 Hours. An advanced course. Pertinent marketing research and information problems and techniques are used to solve an actual marketing problem. Prerequisite: Mktg 362. Business administration students must have declared a major.

369. International Marketing I. 4 Hours. The way a firm sells across international frontiers, including product modification, pricing, intercultural communication, preparation of goods for shipment, and documentation. Focus on problems faced by small firms and multinational corporations. Prerequisite: Mktg. 260.

373. Personal Selling Effort in Marketing. 4 Hours. Personal selling viewed as part of a firm's total marketing effort. Analysis of selling strategies in different types of selling situations; problems of managing the sales force. Emphasis on applications of the behavioral sciences. Prerequisite: Mktg 361 or consent of the instructor.

374. Advertising and Sales Promotion. 4 Hours. The management, planning, creation, evaluation, and use of advertising and sales promotion to communicate among producers, middlemen, and final consumers. Prerequisite: Mktg 361 or consent of the instructor.

390. Special Topics in Marketing. 0 to 12 Hours. May be repeated for a maximum of 12 hours with the approval of the department.

Intensive study of selected problems. Reading assignments are drawn from scholarly and professional journals; emphasis on covering relatively few areas in great depth. Prerequisite: Business administration students must have declared a major.

399. Independent Study in Marketing. 0 to 12 Hours. May be taken for a total of 12 hours. Intensive study of one or more selected topics. The topic and research methodology are determined in consultation with the instructor. Prerequisites: Major in marketing and consent of the head of the department and the instructor obtained prior to registration.

Courses for Graduate Students

400. Introduction to Marketing. 4 Hours. Client/consumer behavior and the way institutions respond to such behavior through the planning, pricing, promotion, and distribution of goods and services.

460. Marketing Management. 4 Hours. The structural system for the management of marketing; environmental considerations; goal determination; the sequential process; marketing planning; product-market integration; channel components; demand stimulation; evaluation and audit. Prerequisite: Mktg 400.

461. Consumer Behavior. 4 Hours. Application of knowledge from the behavioral sciences to the study of consumer behavior. Individual, group, and cultural influences on consumer preferences and purchasing patterns. Emphasis on both theory and application; the advantages and limitations of this approach. Prerequisite: Mktg 400.

463. Information for Marketing Decisions. 4 Hours. Problem definition and the selection of appropriate research techniques for the solution of specific marketing problems; design of the research project, administration of research, and special problems in marketing research. The establishment and administration of information systems to provide the firm with a systematic, continuing appraisal of its market position. Prerequisite: Mktg 400.

464. Sales Force Management. 4 Hours. Problems of hiring, training, compensating, and supervising the sales force, sales forecasting and budgeting; establishment of sales territories and quotas. Case analysis; applications of the behavioral sciences and quantitative methods. Prerequisite: Mktg 400.

465. Advertising and Sales Promotion Management. 4 Hours. The ways in which a firm uses advertising, public relations, sales promotion, and personal selling to communicate with its customers. The functional characteristics of each of these is assessed in terms of varying marketing situations in the process of formulating the firm's strategy. Prerequisite: Mktg 400.

466. Perspectives in Consumerism. 4 Hours. Review of current developments in consumer protection. Events leading to the emergence of the consumer movement, its current status with respect to the right of consumers to be protected against ineffective or unsafe products, and the effectiveness of consumer protection measures. Prerequisite: Mktg 400.

467. Marketing Problems of Small Business. 4 Hours. The unique marketing management and operating problems of small business and its possibilities. Small businesses are viewed as institutions that are qualitatively different from large businesses and have potential for urban economic development. Prerequisite: Mktg 460 or the equivalent.

468. Marketing in the Inner City. 4 Hours. In-depth study of marketing problems in the inner city and proposed solutions to these problems. The inner-city marketplace viewed as a system whose improvement requires interrelated actions by the various individuals and organizations who are or should be involved in it. Prerequisite: Mktg 460 or the equivalent.

470. Social and Legal Environment of the Firm. 4 Hours. Fundamental issues underlying current social and legal problems as they affect and are affected by business. The nature of the relationships among business government, and various publics and the mechanism of social and legal changes. Prerequisite: Graduate standing.

471. International Business Operations. 4 Hours. The policies and problems of firms operating across international frontiers and the social questions they generate. Investing overseas, licensing agreements, and exporting from the home country. Prerequisite: Graduate standing.

472. International Marketing II. 4 Hours. Focus on the firm that operates internationally from its home country base. Particular attention to choosing and working with overseas distributors, promotion and pricing problems, governmental export assistance, and physical distribution matters. Prerequisite: Mktg 400.

473. Marketing Channels Management. 4 Hours. Operations of various institutions that constitute channels for marketing goods and services. Practices of institutions at each level in the distribution system and the interaction that occurs among them. Prerequisite: Mktg 400.

474. Product Planning. 4 Hours. In-depth coverage of all aspects of the product, service, and program-planning process. Conceptual aspects as applied to new and existing product entries. Prerequisite: Mktg 400.

MANAGEMENT INFORMATION SYSTEMS

The management information systems concentration in the MAS program is offered by the Department of Quantitative Methods. The department also offers MAS students elective courses in statistics and operations research. The objective of the management information systems concentration is to provide course work of both technical and managerial relevance to enable graduates to qualify for a host of positions in this rapidly expanding field. Courses are listed separately under Quantitative Methods.

Required courses (12 hours): Quantitative Methods 401—Business Oriented Programming Languages;* Quantitative Methods 435—Management Information Systems; Quantitative Methods 437—Administrative Computer Technology.

*Students may place out of Quantitative Methods 401 by passing an examination on COBOL. These students should select any of the courses listed below to meet the 12 hour requirement.

Elective courses: Quantitative Methods 476—Survey of Operations Research; Quantitative Methods 480—Evaluation Methods; Quantitative Methods 481—Computer Performance Evaluation and Modeling; Quantitative Methods 497—Independent Study.

Other quantitative methods courses may be taken with approval.



CHEMISTRY

William F. Sager, Head of the Department
Jacques Kagan, Director of Graduate Studies

Professors: Joseph H. Boyer, Thomas H. Brown, Richard L. Carlin, Eric A. Gislason, David Gorenstein, Cynthia J. Jamieson, Jacques Kagan, Chui Fan Liu, Clifford N. Matthews, Robert M. Moriarty, Jan Rocek, William F. Sager, Robert I. Walter

Associate Professors: Ronald J. Baumgarten, Richard P. Burns, Robert J. Gordon, Richard J. Kassner, Pierre R. LeBreton, William L. Mock, Robert N. Schwartz

Assistant Professor: Wade A. Freeman, Timothy A. Keiderling, Leonard Kotin, John A. Morrison, Paul R. Young

Work is offered leading to the Master of Science, Doctor of Arts, and Doctor of Philosophy in inorganic, organic, physical, physical organic, and theoretical chemistry and in biochemistry.

The Bernard J. Babler Award for graduate students recognizes outstanding teaching and has been established as a memorial to Professor Babler, who served the department with great distinction from 1957 until his death in 1974.

Admission Requirements

Applicants are considered on an individual basis. Sufficient preparation normally requires completion of a course sequence leading to a bachelor's degree with a major in chemistry and a grade point average of at least 4.00 (A=5.00) in mathematics and science courses exclusive of independent study or research courses. Complete transcripts of undergraduate (and any graduate) course work must be submitted. Three letters of recommendation must also be submitted. In exceptional cases students who have averages of less than 4.00 but above 3.75 may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Potential applicants who have majored in fields other than chemistry must remedy deficiencies in their preparation before being granted full standing in the graduate program. Submission of Graduate Record Examination (GRE) scores (verbal and quantitative test and the advanced test in chemistry) is recommended. Persons who have completed their studies outside of the United States must submit Test of English as a Foreign Language (TOEFL) scores as well as GRE results for the tests listed.

The department will consider applications for nondegree admission. Such applicants must submit a transcript from the institution from which the baccalaureate was received.

Degree Requirements

Master of Science

Hours. 48 quarter hours, of which 32 must be within the Department of Chemistry. The remaining 16 hours may be selected from the offerings of other departments on the basis of their relevance to a particular area of interest. Course work in other departments will be strongly recommended when it is judged advisable for the student's best professional development. At least 16 quarter hours must be taken at the 400 level, of which at least 8 hours must be in regularly scheduled courses (excluding independent study courses and thesis research). Of the 16 quarter hours at the 400 level, 12 must be selected from the course offerings of the Department of Chemistry.

All MS candidates are required to participate in undergraduate teaching, which is assigned in individual cases ac-

cording to background and interest. A minimum of 16 quarter hours is required.

Thesis. Optional; up to 18 quarter hours of thesis research may be credited, subject to the approval of the department

Doctor of Arts

Hours. 144 quarter hours, including a science component of 72 quarter hours (60 quarter hours of chemistry, 12 quarter hours of other natural sciences or mathematics) and an education component of 72 quarter hours (28 quarter hours of courses, 8 quarter hours of a teaching practicum, and 36 quarter hours of research).

Thesis. Candidates must prepare a thesis devoted to a research problem in the teaching of chemistry. This could take many forms and might be based, for example, on approved projects involving module construction, self-paced learning, computer-assisted instruction, computer graphics and animation, or television and film production.

All candidates must meet the department foreign language requirement.

Prospective candidates may obtain detailed information from the Department of Chemistry.

Doctor of Philosophy

In addition to satisfying the general requirements of the Graduate College, students must pass the department cumulative examinations. All formal course work is determined, with the advice of the department, according to its relevance to the student's field of interest. Examples of required courses include Chemistry 404, 405, 406 or a more suitable alternative course sequence.

Thesis. The candidate must prepare a thesis based upon original research carried out under the direction of a qualified member of the department and approved by an examination committee.

The candidate must also meet the department foreign language requirement.

Prospective candidates may obtain detailed information on all requirements by applying to the Department of Chemistry.

Courses for Graduate and Advanced Undergraduate Students

314. Inorganic Chemistry. 4 Hours. Lectures and assigned readings on the chemistry of selected elements. Prerequisite: Chem 340. Winter.

315. Inorganic Chemistry. 4 Hours. Lectures and assigned readings in structural inorganic chemistry, inorganic reaction mechanisms and techniques, and the nature of the coordinate bond. Prerequisite: Chem 342 or the equivalent. Spring.

316. Inorganic Chemistry Laboratory. 2 Hours. Synthesis of inorganic compounds illustrating the use of modern preparative techniques. Prerequisite: Credit or registration in Chem 315.

321. Instrumental Analysis. 5 Hours. Survey of contemporary instrumentation for chemical analysis. Emphasis on methods with actual experience on typical equipment. Prerequisites: Chem 235 and credit or registration in Chem 343 or the equivalents. Fall, Winter.

322. Principles of Chemical Instrumentation. 5 Hours. Construction and principles of modern chemical instrumentation. Emphasis on solid state electronic devices, including general digital electronics. Recommended as adjunct to Chemistry 321, particularly for students specializing in physical or analytical chemistry. Prerequisite: Credit or registration in Chem 341. Spring.

327. Applied Analytical Chemistry I. 5 Hours. Same as Criminal Justice 314. Theory and procedures of separation, purification, and identification of components of industrial and forensic interest. Prerequisites: Chem 121, 235 or CrJ 313.

- 328. Applied Analytical Chemistry II. 5 Hours.** Same as Criminal Justice 315. Advanced instrumental analytical procedures applied to substances of industrial and forensic interest. Prerequisite: Chem 327.
- 338. Systematic Identification of Organic Compounds. 3 Hours.** Primarily a laboratory course; chemical, physical, and spectroscopic methods are used to separate, purify, and identify organic compounds. Prerequisite: Chem 237. Spring.
- 340. Physical Chemistry I. 4 Hours.** Credit is not given for both the Chemistry 340, 342, 344 sequence and the 380, 382 sequence. Introduction to chemical principles. Prerequisites: Chem 119 or 121, credit or registration in Math 133, and one year of college physics. Fall.
- 341. Physical Chemistry Laboratory I. 2 Hours.** Quantitative experimental study of chemical principles. Prerequisite: Concurrent registration in Chem 340. Fall.
- 342. Physical Chemistry II. 4 Hours.** Continues Chemistry 340. Prerequisite: Chem 340. Winter.
- 343. Physical Chemistry Laboratory II. 2 Hours.** Quantitative experimental study of chemical principles. Prerequisites: Chem 341 or InfE 210; concurrent registration in Chem 342. Winter.
- 344. Physical Chemistry III. 4 Hours.** Continues Chemistry 342. Prerequisite: Chem 342. Spring.
- 345. Physical Chemistry Laboratory III. 2 Hours.** Continues Chemistry 343. Prerequisites: Chem 343 and concurrent registration in Chem 344. Spring.
- 347. Introduction to Quantum Chemistry. 4 Hours.** Applications of quantum mechanics to problems of chemical interest. Additional assignments are required. Prerequisite: Chem 344. Fall.
- 348. Thermodynamics. 4 Hours.** Lectures and assigned readings; applications to chemical systems. Prerequisite: Chem 344. Winter.
- 349. Statistical Thermodynamics. 4 Hours.** Introduction to statistical mechanics and application to equilibrium thermodynamics. Prerequisite: Chem 344. Spring.
- 350. Biochemistry I. 4 Hours.** Same as Biological Sciences 370. Chemistry of biological systems, including proteins and enzymes. Prerequisites: Chem 119 or 121 and credit or registration in Chem 235. Fall.
- 351. Biochemistry II. 4 Hours.** Same as Biological Sciences 371. Continues Chemistry 350. Carbohydrate and lipid metabolism. Electron transport. Prerequisite: Chem 350. Winter.
- 352. Biochemistry III. 4 Hours.** Same as Biological Sciences 372. Continues Chemistry 351. Metabolism of amino acids, nucleic acids, and proteins; the biosynthesis of biological macromolecules. Prerequisite: Chem 351. Spring.
- 353. Chemical Biogenesis. 4 Hours.** Same as Biological Sciences 353. Biosynthesis of important biological compounds. Prerequisite: Chem 235. Spring.
- 355. Biochemistry Laboratory I. 2 Hours.** Introduction to experimentation with biochemical systems, processes, and compounds of biochemical importance. Prerequisites: Chem 121 and registration in Chem 350. Fall.
- 357. Biochemistry Laboratory II. 2 Hours.** Continues Chemistry 355. Prerequisites: Chem 355 and registration in Chem 351. Winter.
- 361. Advanced Organic Chemistry I. 4 Hours.** A physical-organic approach to organic reactions; particular emphasis on reaction mechanisms and the relationship between reactivity and structure. Lectures and assigned readings. Prerequisite: Chem 235. Fall.
- 362. Advanced Organic Chemistry II. 4 Hours.** Continues Chemistry 362. Lectures and assigned readings. Prerequisite: Chem 361. Winter.
- 380. Principles of Physical Chemistry I. 4 Hours.** Credit is not given for both the Chemistry 380, 382 sequence and the 340, 342, 344 sequence. Chemistry 380 and 382 provide an elementary introduction to physical chemistry; particular emphasis on topics of importance in the biological and health sciences. Prerequisites: Chem 119 or 121, Math 131, and two terms of physics. Winter.
- 382. Principles of Physical Chemistry II. 4 Hours.** Continues Chemistry 380. Prerequisite: Chem 380. Spring.
- 383. Elementary Physical Chemistry Laboratory. 1 Hour.** An introductory course. Prerequisite: Chem 380. Spring.
- 392. Independent Study. 1 to 4 Hours.** May be repeated for credit. Individual study, under close supervision of a faculty member, in areas

not covered in standard courses. Credit is contingent on the submission of a written report to both the supervisor for approval and the Department of Chemistry for information. A maximum of 8 hours of Chemistry 392 and 399 combined may be credited toward department undergraduate-degree course requirements. Prerequisites: Approval of the department and consent of the instructor.

399. Independent Research. 3 Hours or More. May be repeated for credit. Individual research performed under the close supervision of a faculty member. Credit is contingent on the submission of a written report to both the supervisor for approval and the Department of Chemistry for information. A maximum of 8 hours of Chemistry 392 and 399 combined may be credited toward department undergraduate-degree course requirements. While research experience is strongly encouraged for career students, the department does not include this course in computing the grade point average for admission of graduate students. Prerequisites: Approval of the department and consent of the instructor.

Courses for Graduate Students

- 404. Quantum Mechanics. 4 Hours.** Required of all PhD students in chemistry. Exact solution of the Schrodinger equation for simple systems; variational principle; approximation methods in complex systems; effects of electric and magnetic fields. Fall.
- 405. Molecular Spectroscopy. 4 Hours.** Required of all PhD students in chemistry. Analysis and interpretation of molecular spectra, including electronic, vibrational, magnetic resonance, and Mossbauer spectra. Winter.
- 406. Chemical Applications of Group Theory. 4 Hours.** Required of all PhD students in chemistry. Introduction to the use of group-theoretical methods in the analysis of spectroscopic problems; ligand and field theory; molecular orbital calculations. Spring.
- 410. Current Problems in Inorganic Chemistry. 2 Hours.** May be repeated for credit. Analysis of fundamental concepts as they appear in a modern research context.
- 412. Special Topics in Inorganic Chemistry. 2 to 4 Hours.** Lectures on topics not represented in regularly scheduled courses. Fall.
- 415. Complex Inorganic Compounds. 4 Hours.** Stereochemistry, reactions, and theory of bonding of coordination compounds. Spring.
- 416. Advanced Inorganic Chemistry I. 4 Hours.** Contemporary inorganic chemistry; emphasis on properties of nonmetals and lighter elements. Prerequisite: Chem 314, 315, or the equivalents.
- 417. Advanced Inorganic Chemistry II. 4 Hours.** Contemporary inorganic chemistry; transition metals. Prerequisite: Chem 416.
- 423. Catalysis in Enzymology. 4 Hours.** Application of physical organic chemistry to the understanding of enzyme action and the mechanisms of biochemical reactions. Prerequisites: Chem 351, 362. Spring.
- 424. Enzyme Kinetics. 4 Hours.** Application of steady state kinetics to the understanding of enzyme action and the mechanisms of biochemical interactions. Prerequisite: Chem 351.
- 425. Bioenergetics. 4 Hours.** Thermodynamic changes associated with the formation of chemical gradients, the transformation of metabolites, oxidation-reduction reactions, and the synthesis of macromolecules, including detailed consideration of mechanisms of oxidative and photophosphorylation. Prerequisites: Chem 344, 351. Spring, alternate years.
- 429. Topics in Biochemistry. 2 to 4 Hours.** May be repeated for a maximum of 16 hours of credit. Selected topics of current interest in biochemistry. Prerequisite: Chem 352 or consent of the instructor.
- 431. Literature Seminar on Organic Chemistry. 1 Hour.** Satisfactory/unsatisfactory grade only. Presentation of student papers on current research topics; preparation and distribution of abstracts. Discussion is an integral part of the course. Fall, Winter, Spring.
- 432. Special Topics in Organic Chemistry. 4 Hours.** Discussion of topics of current interest.
- 433. Special Topics in Reaction Mechanisms. 4 Hours.** Theory and techniques in specialized areas in reaction mechanisms. Prerequisite: Chem 437 or consent of the instructor.
- 435. Advanced Organic Synthesis. 4 Hours.** Discussion and laboratory work involving special techniques in organic synthesis. Prerequisite: Credit or registration in Chem 437.

437. **Survey of Organic Chemistry I. 4 Hours.** Topics on synthesis, mechanisms, and stereochemistry at an advanced level. Fall.
438. **Survey of Organic Chemistry II. 4 Hours.** Continues Chemistry 437. Prerequisite: Chem 437. Winter.
440. **Current Problems in Physical Chemistry. 2 Hours.** May be repeated for credit. Analysis of fundamental concepts as they appear in a modern research context.
441. **Molecular Dynamics. 4 Hours.** Theoretical and experimental methods of studying elastic, inelastic, and reactive collisions of molecules. Classical quantal calculations and semiclassical scattering theory, potential energy surfaces, simple models of reactive scattering, classical trajectories, S-matrices, theories of chemical kinetics, electronic structure and symmetry effects, vibrational relaxation, and gas-surface interactions. Prerequisite: Chem 344 or the equivalent.
442. **Special Topics in Physical Chemistry. 2 to 4 Hours.** Lectures and reading in areas not normally treated in standard courses. Discussions of topics of current interest.
443. **Special Topics in Chemical Kinetics. 2 to 4 Hours.** Theory and techniques in specialized areas. Prerequisite: Chem 349 or the equivalent. Winter.
446. **Quantum Chemistry I. 4 Hours.** Treatment of complex atoms and molecular systems. Hartree-Fock calculations and other methods; interactions of radiation with matter. Prerequisite: Chem 406.
447. **Quantum Chemistry II. 4 Hours.** Continues Chemistry 446. Prerequisite: Chem 446.
461. **Synthetic Methods of Organic Chemistry I. 4 Hours.** Discussion of methods used in organic synthesis; introduction and modification of functional groups, methods of selective group protection, stereospecific processes, recent examples of applications. Prerequisite: Credit or registration in Chem 438 or consent of the instructor. Spring.
462. **Synthetic Methods of Organic Chemistry II. 4 Hours.** Continues Chemistry 461. Prerequisite: Chem 461.
473. **Teaching Methods in Chemistry. 4 to 12 Hours.** May be repeated for credit. Special problems and techniques, including audio-visual methods, lecture demonstrations, the design of experiments, and computer applications. Prerequisite: Graduate standing in the Doctor of Arts program.
476. **Teaching Physical, Inorganic, and Analytical Chemistry. 2 Hours.** Seminar on the presentation and articulation of physical, inorganic, and analytical chemical ideas in the undergraduate context. Prerequisite: Chem 473.
477. **Instructional Research. 0 to 16 Hours.** May be repeated for credit. Credit is contingent on the submission and approval of a thesis. Satisfactory/unsatisfactory grade only. Design, construction, and testing of instructional modules applicable to undergraduate education. Prerequisite: Chem 373 and approval of the department.
499. **Thesis Research. 0 to 16 Hours.** May be repeated for credit. Satisfactory/unsatisfactory grade only. Prerequisite: Approval of the department.

COMMUNICATION AND THEATER

Anthony Graham-White, Head of the Department
Barbara Wood, Director of Graduate Studies

Professors: Donald H. Dickinson, Anthony Graham-White, R. Victor Harnack, Paul Carter Harrison (Adjunct), Presley Holmes (Adjunct), Thomas Kochman, Chester C. Long, Carl A. Pitt (Emeritus), Harry J. Skornia (Emeritus), Barbara Wood

Associate Professors: Katharine Loesch, Natalie Schmitt

Assistant Professors: Julia M. Curry, Dan Doeden, Christopher L. Harris (Visiting), Conde Hoskins (Emeritus), Helen Hovde (Emeritus), John A. Jones, Jin Keon Kim (Visiting), Theodore V. Kundrat, Robert Mills, William J. Raffeld, Nanalee Raphael, Dennis Rich

Lecturers: Carol Berthold, Sandra Finkelstein

The department offers work in communication, mass communication, and theater that leads to the Master of Arts. Special facilities available to graduate students include the Social Science Research Laboratory, a theater, radio and television studios, computers, and the Eric/Education Module.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study, and the equivalent of 30 quarter hours of study in communication and/or theater. Complete transcripts of undergraduate (and any graduate) work must be submitted. In exceptional cases, students who have averages below 4.00 but above 3.75, or fewer than 30 quarter hours of work in communication and/or theater, may be admitted if they show promise of completing the program successfully. Such students may be admitted on limited status and required to remedy deficiencies in their background before being admitted to regular status. Applicants must submit three letters of recommendation, at least two of them of an academic nature, and complete a 600-word statement of intent.

The department accepts nondegree students who meet the Graduate College criteria for admission (p. 31). The head of the department and the director of graduate studies will meet with the instructor(s) of courses that the nondegree student takes, after the student's first and second quarters in the department, to evaluate the student's progress.

Degree Requirements

Degree requirements are being revised; consult the department for details.

Hours. A minimum of 48 quarter hours is required, of which 28 must be at the 400 level; 12 may be in approved courses in other departments. Communication and Theater 400 and 499 are required of all students. The rest of a student's program is worked out in conjunction with an adviser; it may include, upon petition to the director of graduate studies, more than 12 hours in other departments if the logic of the student's program demands it.

Thesis. When a student is ready to write a thesis, two oral examinations will be required: a qualifying examination based upon the thesis proposal and a defense of the completed thesis. The examination will be conducted by a committee composed of the student's adviser and at least two other members of the faculty; one member of the committee may be a faculty member from another department. Amplification

of procedures is available from the department office.

A student's program will follow this pattern:

ComTh 400	4 hours
400-level courses	12 hours <i>minimum</i>
300-level courses	20 hours <i>maximum</i>
ComTh 499	12 hours
	48 hours

Courses for Graduate and Advanced Undergraduate Students

301. Communication Analysis. 4 Hours. Descriptions, models, proposed dimensions, and statistical treatment of the communication process. Prerequisites: ComTh 112, 113, and 210 or consent of the instructor. Wood, Winter.

302. Group Communication Theory. 4 Hours. Detailed analysis and observation of group processes from the viewpoint of modern information and field communication theory. Prerequisites: ComTh 111, 112, 113, 210, and 211 or consent of the instructor. Harnack, Winter.

303. Theories of Language Performance. 4 Hours. Contemporary theories and related research in language performance, centering on selected approaches to language acquisition and behavior; special emphasis on the psycholinguistic approach. Prerequisites: ComTh 112, 210 or the equivalents or sufficient language-linguistic background or, for graduate students, consent of the instructor. Wood, Fall.

308. Linguistic Phonetics. 4 Hours. Same as Linguistics 312. The relationship of articulatory, acoustic, and auditory phonetics to the study of language. Prerequisite: Ling 310, or junior standing and consent of the instructor.

309. Experimental Phonetics. 4 Hours. Same as Linguistics 314. Contributions of instrumental techniques and experimental design to the study of phonetics. Prerequisite: Ling 310, or junior standing and consent of the instructor.

310. Rhetorical Criticism. 4 Hours. Analysis and evaluation of critical standards for rhetorical interpretation. Application of critical standards to contemporary rhetorical events of particular interest to the student. Prerequisite: ComTh 213 or consent of the instructor.

311. American and British Public Address. 4 Hours. Critical and historical study of American and British speakers and their speeches to 1900. Prerequisites: ComTh 111, 112, 113, and any two of ComTh 211, 212, 213, or consent of the instructor. J.A. Jones Fall.

312. Modern Public Address. 4 Hours. Continues Communication and Theater 311. From 1900 to the present. Prerequisites: ComTh 111, 112, 113, and any two of ComTh 211, 212, 213 or consent of the instructor. Harnack, Winter.

313. Professional Speech Writing. 4 Hours. Theory and practice in writing manuscript speeches for presentations by executives in business, industry, and government. Prerequisites: ComTh 100, 213; or consent of the instructor.

315. The Rhetoric of Free Speech. 4 Hours. The rhetorical processes employed by those speakers in the British House of Commons and in America who participated in the freedom of speech movements. Issues relating to the contemporary American scene. Prerequisites: ComTh 212, PolS 355; or consent of the instructor. Harnack, Winter.

316. Conflict, Confrontation, and Communication. 4 Hours. Conflict in human relationships and how to cope with it positively in interpersonal, group, and community situations. Practical analysis of situations exhibiting conflict. Prerequisites: Any two of ComTh 211, 212, 213 or, for graduate students, consent of the instructor.

320. Black Theater in America I. 4 Hours. Same as Black Studies 320. Development and contribution of Black playwrights, actors, and directors in American theater, 1800-1940. Socioeconomic, psychological, and political ideas in the works of both Black and white playwrights, together with the image of the Black artist and character in American plays. Prerequisite: ComTh 110 or B1St 171 or consent of the instructor.

321. Black Theater in America II. 4 Hours. Same as Black Studies 321. Development and contribution of Black playwrights, actors, and directors in American theater, 1940 to present. Prerequisite: ComTh 110 or B1St 171 or consent of the instructor.

324. American Theater History I. 4 Hours. Development from 1700 to 1914; historical trends and dramatic literature. Prerequisite: ComTh 209; or, for graduate students, consent of the instructor.

325. American Theater History II. 4 Hours. Development from 1914 to the present; native and European influences on theatrical trends. Prerequisite: ComTh 209; or, for graduate students, consent of the instructor. Schmitt, Spring.

328. Propaganda and Political Public Relations. 4 Hours. Same as Political Science 328. The nature of propaganda, political symbols, and political public relations; the uses of political symbols and propaganda in the political processes of democratic and totalitarian societies; international propaganda and psychological warfare; methods and uses of propaganda analysis. Prerequisite: PolS 200 or consent of the instructor.

331. Television Programming. 4 Hours. Television program types, objectives, methods, and effects; creative development of programs from conception to script. Prerequisites: ComTh 232 and one other communication and theater course or, for graduate students, consent of the instructor.

332. Radio Programming. 4 Hours. Theories and goals in contemporary radio programming. Major radio formats, operating philosophies, radio audience behavior, and rating services. Prerequisite: Junior standing.

333. Special Topics in Mass Communications. 4 Hours. May be repeated for credit up to 8 hours. The nature of mass media in contemporary society. Prerequisite: Two courses in communication and theater, including ComTh 131, or, for graduate students, consent of the instructor. Spring.

334. Global Mass Communications. 4 Hours. The broadcast systems of the nations of the world; alternative and "mixed" systems; international organizations, agreements, exchanges, and problems; broadcasts to and from other countries; implications of such new developments as satellites; mass and nonmass uses. Prerequisites: ComTh 113, 131, 231, or consent of the instructor. Fall.

336. Continuity Writing. 4 Hours. The various forms of non-dramatic continuity—media, commentary, musical continuity, documentary scripting—are analyzed in light of the particular way in which electronic media reach their audience. Prerequisite: ComTh 232 or, for graduate students, consent of the instructor.

337. Mass Communications Law. 4 Hours. Principles and development of freedom of communication; limits on free expression; communication law and the public interest. Readings and discussion of precedent-setting court cases. Prerequisite: ComTh 131 or consent of the instructor.

341. Oral Interpretation of Shakespeare. 4 Hours. Study of a comedy, a tragedy, a history, and a tragicomedy. Performative implications of the prosody and language. Performance will be required. Prerequisites: ComTh 141 and ComTh 261 or Engl 131 or consent of the instructor.

351. Theater History and Criticism I. 4 Hours. Origins of the theater. Greek, Roman, and medieval drama and theater. Prerequisites: ComTh 151, 161, 209, 264, and concurrent registration in ComTh 352 or 353 or, for graduate students, consent of the instructor.

352. Advanced Acting Techniques I. 4 Hours. Theories and techniques of acting and directing for Greek, Roman, and medieval drama. Prerequisite: Concurrent registration in ComTh 351.

353. Advanced Techniques of Theater Production I. 4 Hours. Architecture and settings for Greek, Roman, and medieval theater; modern design approaches to the drama of these periods. Prerequisite: Concurrent registration in ComTh 351.

354. Theater History and Criticism II. 4 Hours. Renaissance Italian, including *commedia dell'arte*, Spanish, and English theater. Neoclassic French theater. Prerequisites: ComTh 151, 161, 209, 264, and concurrent registration in ComTh 355 or 356 or, for graduate students, consent of the instructor.

355. Advanced Acting Techniques II. 4 Hours. Theories and techniques of acting and directing for Renaissance and neoclassic drama. Prerequisite: Concurrent registration in ComTh 354.

356. Advanced Techniques of Theater Production II. 4 Hours. Architecture and settings for Renaissance and neoclassic theater; modern design approaches to the drama of these periods. Prerequisite: Concurrent registration in ComTh 354.

357. Theater History and Criticism III. 4 Hours. Restoration

comedy, eighteenth- and nineteenth-century European and American theater; emphasis on genres and literary movements. Prerequisites: ComTh 151, 161, 209, 264, and concurrent registration in ComTh 358 and/or 359.

358. Advanced Acting Techniques III. 4 Hours. Theories and techniques of acting and directing for Restoration comedy and eighteenth- and nineteenth-century drama. Prerequisite: Concurrent registration in ComTh 357.

359. Advanced Techniques of Theater Production III. 4 Hours. Architecture and settings for Restoration and eighteenth- and nineteenth-century theater; modern design approaches to the drama of these periods. Prerequisite: Concurrent registration in ComTh 357.

360. Theater Architecture and Production. 4 Hours. Seminar on esthetic and technical problems presented by the interrelation of theater, stage, audience, and play. Field study of types of Chicago theaters and stages. Prerequisites: ComTh 151, 351 or consent of the instructor. Winter.

364. Special Topics in Theatrical Design. 4 Hours. May be repeated for a maximum of 12 hours of credit. Twentieth-century styles; design for the contemporary stage. Problems in conceptualization, realization, and execution. Prerequisites: ComTh 151 and 252; or ComTh 153 and 254; or consent of the instructor.

365. Advanced Stage Direction. 4 Hours. Procedures for developing a creative relationship between director and actor in interpreting a play in rehearsal; historical consideration of directorial methods. Class analysis of problems of interpretation and stage management; assignment of scenes to demonstrate dramatic values. Prerequisite: ComTh 264 or, for graduate students, consent of the instructor.

372. Instructional Applications of Television and Radio. 4 Hours. Television and radio as instructional communications media; the design of instructional materials relating the communications requirements of subject matter to communications capabilities of television and radio; production, utilization, and evaluation of instructional television and radio presentations. Prerequisites: ComTh 131 and two courses from ComTh 231, 232, 233 or consent of the instructor. Fall.

374. Media Internship. 4 to 12 Hours. Media communication studies in a field setting. Students work in an approved professional field setting to investigate the uses of appropriate and relevant electronic media. Problem-solving approach; individual projects developed through conferences with a University faculty member and a department-selected field supervisor. Prerequisites: ComTh 232 and consent of the department head, obtained one term in advance. Fall, Winter, Spring.

375. Field Study. 4 to 16 Hours. Placement with a variety of community organizations and agencies whose work is heavily dependent on communication or theatrical performance. The student is an observer or a participant-observer and produces a critical analysis of communication or performance processes. Prerequisite: Consent of the instructor.

380. Ethnography of Communication. 4 Hours. Social interaction viewed in terms of its context. The role of the investigator as participant-observer. The taxonomic method of description and analysis. Focus on urban contexts. Prerequisite: ComTh 192 or consent of the instructor. Kochman, Spring.

384. The Psychology of Language. 4 Hours. Same as Linguistics 374 and Psychology 354. Introductory survey of methods, theory, and research; the history and present status of psychology's interest in language behavior. Prerequisite: Consent of the instructor.

388. Nonprint Media and the Teaching of English. 4 Hours. Same as English 388. The effects of film, television, and technology on the teaching of English. Prerequisite: Senior standing or 12 hours of English. Lindley, Fall.

390. Communication, Culture, and Society. 4 Hours. The cultural and social significance of various types of communicative behavior. Specific focus on attitudes and interactional patterns shaped or influenced by oral and literate cultural systems, ethnic group life (Afro-American, mainstream), and colonialism. Prerequisite: ComTh 380.

398. Independent Study. 1 to 4 Hours. May be repeated for a maximum of 8 hours of credit. Individual investigation of special problems that may be student-initiated or related to faculty research. May also be used for University-sponsored projects, such as interdisciplinary seminars. Prerequisites: Senior standing and approval of the department.

Courses for Graduate Students

400. Introduction to Graduate Study. 4 Hours. Research trends and methods in communication and theater; the purpose and practice of scholarly writing. Focus on concerns common to communication, mass communication, and theater. Prerequisites: Same as admission requirements. Graham-White, Wood, Fall.

401. Experimental Psycholinguistics. 4 Hours. Same as Linguistics 471 and Psychology 401. Intensive review of experimental laboratory studies on the effects of phonological, syntactic, and semantic variables on sentence perception, comprehension, production, and memory in the mature user of language. The relevance of the research in contemporary psycholinguistic theory is emphasized. Prerequisites: ComTh 384 or the equivalent and consent of the instructor.

404. Speech and Language Behavior. 4 Hours. Speech and first-language development; speech and language differences and related communicative problems within and across subcultures; recent research in speech and language mechanisms. Prerequisite: ComTh 303 or language-theory background. Wood, Winter.

407. Interpersonal Communication. 4 Hours. Studies of problem-solving in dyadic and larger small-group structures. Prerequisite: ComTh 302 or the equivalent. Kochman, Winter.

413. Persuasion. 4 Hours. Contemporary theory and research involving variables in the persuasive process. Prerequisites: ComTh 311, 312, 315 or the equivalent. J.A. Jones, Fall.

421. Special Topics in Theater History. 4 Hours. May be repeated for up to 12 hours of credit. European, American, Asian, or African theater history of a scope sufficient to illuminate general problems of theatrical style and convention and/or periodization and historical development. The topic selected will often be the subject of current controversy or new methodological approaches. Prerequisites: Any two of ComTh 320, 321, 324, 325, 326, 351, 354, 357 or the equivalents. Staff, Fall, Winter, Spring.

422. Theories of Theater. 4 Hours. May be repeated for up to 12 hours of credit. Nature of the theatrical experience. Emphasis on topics varies, such as theatrical esthetics in different cultures or the theories of contemporary theater practitioners. Prerequisite: Three 300-level theater courses. Staff, Fall, Winter, Spring.

423. Special Topics in Criticism. 4 Hours. May be repeated for up to 12 hours of credit. Seminar on theatrical criticism. Intensive analysis of an individual critic or school or critical history of an important play; preparation of original criticism, applying existing standards and developing the student's individual approach. Prerequisites: Any two of ComTh 320, 321, 324, 325, 326, 351, 354, 357 or the equivalents. Staff, Winter.

425. Special Topics in Rhetorical Criticism. 4 Hours. May be repeated for a maximum of 12 hours of credit. Examination and application of a selected critical approach that focuses upon the rhetoric of an issue, a movement, a particular period, a speaker, or a campaign. Preparation of original criticism using the selected critical approach. Prerequisite: ComTh 310.

434. International Communication. 4 Hours. International and regional efforts, activities, organizations, and problems of the mass media (electronic, satellite, printed); propaganda, exchanges, and such regional efforts and organizations as Eurovision, the Asian Broadcasting Corporation, and International Researchers and Findings. Prerequisite: ComTh 334 or the equivalent. Staff, Winter.

439. Television and Society. 4 Hours. The performance of radio and television in term of content, government and industry controls, social responsibility, economic bases, and effects. Prerequisite: Any one of ComTh 302, 333, 334, 337; or consent of the instructor. Staff, Fall.

495. Problems of Teaching Speech. 4 Hours. Teaching methods and procedures, especially at the college level. Prerequisite: Consent of the instructor. Harnack, Spring.

498. Independent Research. 4 to 8 Hours. May be repeated for credit up to a maximum of 8 hours. Department-approved research projects not included in thesis research. Prerequisite: Consent of the head of the department. Staff, Fall, Winter, Spring.

499. Thesis Research. 8 to 12 Hours. May be repeated in blocks of 4 to 8 hours of credit to a maximum of 12 hours. On acceptance of the thesis by the examining committee, 12 hours of credit in ComTh 499 will be granted. Prerequisite: Consent of the thesis committee. Staff, Fall, Winter, Spring, Summer.

CRIMINAL JUSTICE

James W. Osterburg, Head of the Department
David Fogel, Director of Graduate Studies

Professors: James T. Carey, David Fogel, Joseph D. Nicol,
James W. Osterburg, Donald H. Riddle

Associate Professors: Bernard Dolnick, Fredric L. DuBow,
Marshall Hartmen (Adjunct), Sidney Hyman, Weldon T.
Johnson, Wayne A. Kerstetter, Patrick D. McNany, Michael
D. Maltz, Jack B. Schmetterer (Visiting), Earl E. Strayhorn
(Adjunct), Richard H. Ward

Assistant Professors: Stephen M. Balkin, Larry C. Berkson
(Adjunct), Nathan T. Clark, Shari S. Diamond, David P. Duff
(Visiting), Patrick J. Hughes (Visiting), Juei-Ho Liu, David
F. Luckenbill, Richard McCleary, Frank T. Morn, Gregory J.
Schlesinger (Adjunct), Michael H. Walizer (Visiting)

The Department of Criminal Justice offers work leading to the Master of Arts in Criminal Justice and the Master of Science in Criminalistics. Advanced training is provided in the theory and practice in the criminal justice system, including law enforcement, courts, corrections, the community, criminal law, social control, related social sciences, and criminalistics. Research methodology, evaluation techniques, and administrative theory and behavior are also treated in the curriculum.

Admission Requirements

Applicants to the Master of Arts in Criminal Justice program should have a strong background in the social sciences (a minimum of 20 quarter hours in advanced courses). A basic course in statistical methods is required or the equivalent methodological skills must be acquired by the end of the first term of residence. Applicants to the Master of Science in Criminalistics program should have a strong background in the natural or physical sciences (a minimum of 20 quarter hours in advanced courses) and a basic course in statistical methods.

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) on the final 90 quarter hours (60 semester hours) of undergraduate study and must submit Graduate Record Examination scores on the verbal and quantitative aptitude test. If given, the score for the advanced test in the undergraduate major must also be submitted. Complete transcripts of undergraduate (and any graduate) work must be submitted. Applicants are also required to provide three letters of recommendation, preferably from professors familiar with the student's recent work, or, in the case of applicants with professional experience, from supervisors. Applicants must submit a one-page statement of their reasons for desiring to take graduate work in criminal justice and the relationship of this advanced training to their professional and other goals. In exceptional cases, applicants with grade point averages below 4.00 but above 3.75, or without strong backgrounds in either the social sciences or the natural and physical sciences, may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such students may be admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status. No credit toward the degree is given for courses taken to remedy deficiencies.

The department will consider applicants for nondegree admission. Such applicants must submit transcripts from all colleges and universities attended in the last eight years.

Degree Requirements

All students must complete a minimum of 48 quarter hours of graduate work distributed as follows:

1. *Core Program.* 20 quarter hours
 - Criminal Justice 400—Systems Concepts, 4 hours
 - Criminal Justice 410—Processes and Institutions, 4 hours
 - Criminal Justice 470—Law and Its Byways, 4 hours
 - Criminal Justice 480—Crime and Social Control, 4 hours
 - Criminal Justice 490—Research Methodology, 4 hours

A student with extensive undergraduate work in core areas may, at the discretion of the adviser, substitute other 400-level courses of equal credit in the same substantive areas.

2. *Electives.* 12 to 24 quarter hours selected in consultation with the student's adviser. At least 8 quarter hours must be at the 400 level. Candidates for the MA should emphasize courses in police science, criminal law, corrections, criminal justice administration, or the theory of criminal justice. Candidates for the MS should emphasize courses in criminalistics.

3. *Major Paper Option.* 4 to 16 quarter hours in a master's thesis, master's paper, or internship paper.

The *master's thesis* emphasizes research design, the collection and organization of data, and the integration of course materials. A thesis is appropriate for the student who is planning a research career or further graduate study. From 12 to 16 quarter hours may be applied to the degree requirements.

The *master's paper* option is designed to demonstrate, in a paper of general scope, the student's ability to integrate knowledge in the field of criminal justice or criminalistics. It is appropriate for the student whose career interests lie either in teaching or in administration. From 6 to 10 quarter hours may be applied to the degree requirements.

The *internship paper* option emphasizes the integration of course materials with learning experiences in a series of field internships among operating criminal justice agencies. It is appropriate for students who wish to teach, for the student without experience in criminal justice, or for students who wish to broaden the base of their existing knowledge. An internship report is required, which must evaluate critically the internship experiences and demonstrate their integration with several areas of criminal justice. From 4 to 8 quarter hours may be applied to the degree requirements.

The three options are not mutually exclusive. A student who elects the *thesis* option or the *master's paper* option may choose to participate in some field internship experience. Similarly, the student who elects the *master's paper* option or the *internship paper* option may convert the master's paper or internship paper into a thesis. All changes will be made with the approval of the adviser and reported to the department through the completion of the proper forms.

4. A candidate must pass a *comprehensive examination*, given at least once each term, by the end of the third term of full-time residence or the equivalent. The examination may be repeated once, within two terms of full-time residence or the equivalent, if the first attempt is unsuccessful.

Courses for Graduate and Advanced Undergraduate Students

313. **Advanced Criminalistics Analysis Laboratory. 5 Hours.** Continues Criminal Justice 211. More advanced concepts of identification and individualization, including the examination of less frequently encountered physical evidence materials, and empirical data requirements for interpretation of examinations. Prerequisites: CrJ 210, 211. Nicol, Fall.

314. **Applied Analytical Chemistry I. 5 Hours.** Same as Chemistry 327. Theory and procedures of separation, purification, and identi-

fication of components of industrial and forensic interest. Prerequisites: Chem 121, 235 or CrJ 313. Nicol, Winter.

315. Applied Analytical Chemistry II. 5 Hours. Same as Chemistry 328. Advanced instrumental analytical procedures applied to substances of industrial and forensic interest. Prerequisite: CrJ 314. Nicol, Spring.

330. Complex Organizations in the Criminal Justice System. 4 Hours. Exploration and analysis. Police departments, courts, and prison structure in context and mutual permeability with their environments. Special attention to research questions. Prerequisite: Junior standing. Winter.

333. Sociology of Law. 4 Hours. Same as Sociology 333. The origin and development of legal norms in various social settings; their relationship to custom and incorporation in legal and quasi-legal institutions; special attention to the difference between legal and sociological reasoning; law as an instrument of social change. Prerequisites: 8 hours of upper-division sociology, including Soc 230; or CrJ 206 and 230; or consent of the instructor.

335. Organized Crime in the United States. 4 Hours. The development of organized crime throughout history; detailed consideration of the political, social, and economic conditions involved in the appearance, spread, and expansion of organized crime in America. Prerequisites: CrJ 101, 102, 230.

338. Basic Forensic Anthropology. 4 Hours. Same as Anthropology 338. Anthropological methods and techniques used to identify and interpret human remains in paleontology, archeology, and criminal, insurance, and mass disaster investigations. Prerequisites: Junior standing and 8 hours of either anthropology or criminal justice; Anth 231 or consent of the instructor.

339. Institutional Treatment of Offenders. 4 Hours. The role of custodial and correctional institutions in the treatment of the offender; philosophy of administration and management of institutions; survey of historical development and current trends in jails and prisons. Prerequisites: CrJ 101, 102. Fall.

340. Criminal Self and Criminal Careers. 4 Hours. The development of criminal self-conceptions; social-psychological processes of group alienation; development of commitment and professionalization in the development of criminal careers. Selected case studies. Prerequisites: Soc 100, CrJ 231. Carey, Winter.

343. Comparative Alternatives to Imprisonment. 4 Hours. Survey of alternatives to imprisonment found in East and West Europe. After examination of these alternatives by means of legal, sociological, and correctional theories, models for noncustodial programs are developed for possible application to the American criminal justice system. Prerequisites: CrJ 101, upper-division standing.

345. Community Treatment of Offenders. 4 Hours. The history and development of programs relating to community treatment of offenders; the philosophies and programs dealing with the rehabilitation and reintegration of the offender into society. Prerequisites: CrJ 101, 102, Soc 225, 276. Winter.

350. The Role of Law Enforcement in Community Relations. 4 Hours. Analysis of the relationship between law enforcement and the social structure of the community; the significant problem areas involving minority elements, cultural and ethnic groups, power and social-elite and political and social-action movements. Prerequisites: CrJ 101, 102, Soc 225 or 276. Spring.

351. Criminal Law I: Substantive Criminal Law. 4 Hours. Required in the criminal justice curriculum; cannot be substituted for a criminal law course taken by law students. General doctrines of criminal liability in the United States; classification of crimes as against persons, property, and the public welfare. Emphasis on the concept of governmental sanctions of the conduct of the individual. Prerequisites: CrJ 101, 102, consent of the department, and declaration of a major in criminal justice. McAnany, Fall, Winter, Spring.

352. Criminal Law II: Criminal Procedure. 4 Hours. Required in the criminal justice curriculum; cannot be substituted for a criminal law course by law students. The criminal process. Legal problems associated with the investigation of crime, the acquisition of evidence, the commencement of a criminal proceeding, the prosecution and defense of charges, sentencing, and appeal. Principal concern is with the development of existing procedures and examination of current efforts for reform. Prerequisites: CrJ 351, consent of the department, and declaration of a major in criminal justice.

353. Criminal Law III: The Instrumentalities of Criminal Justice. 4 Hours. Continues Criminal Justice 352. The agencies that play sig-

nificant roles in the criminal process. Functions of the law enforcement agency, counsel, and the courts. Particular emphasis on the responsibilities and interrelationships of the agencies examined. Prerequisite: CrJ 352.

354. Evidence. 4 Hours. Rules of evidence as they apply to judicial proceedings and administrative hearings relative to the criminal process. Development of the underlying rationale of the rules. Emphasis on the relationship between methods of evidence collection and admissibility. Prerequisite: CrJ 352.

355. Law of Corrections. 4 Hours. Sentencing, probation, parole, incarceration, fines, pardon, and the problems of the exoffender. Special emphasis on the constitutional and statutory limitations on the discretion of the various administrators in the correctional system and the manner in which the Constitution limits the choice of correctional alternatives. Prerequisite: CrJ 339 or 345 or 351.

360. Industrial and Commercial Security Administration. 4 Hours. Theories and philosophy of the administration of industrial and commercial security functions; survey of contemporary organization and management of security operations; application of law enforcement principles within private enterprise. Prerequisites: CrJ 103, 258, 259.

381. History of Crime Control. 4 Hours. The history of the penitentiary, urban police, private police, state police, and national police. Various types of crime relating to the development of police and penology in their historical context. The rise of casual, professional, and organized crime in the nineteenth and twentieth centuries is emphasized. Prerequisite: Upper-division standing.

382. History of Corrections. 4 Hours. Survey of the history of punishment, prisons, and penology in America. The social, intellectual, and institutional environment in which corrections evolved. The punishment experience as seen by the official and offender. Prerequisites: CrJ 101, 102, and junior standing.

391. Proseminar on Criminal Justice. 4 Hours. Study in depth of current issues, problems, and developments of serious concern within the field of the administration of criminal justice. Prerequisites: Junior standing and CrJ 101, 102.

395. Internship. 4 Hours. Observation of and participation in the daily work of a criminal justice agency. Work is supervised by a faculty member and the management personnel of the agency. Prerequisites: Senior standing and consent of the instructor.

397. Psychology and the Law. 4 Hours. Same as Psychology 397. Application of psychological theories to legal problems; evaluation of the different approaches of law and psychology; methods for bringing about and evaluating social change through legal innovation. Prerequisites: CrJ 101, 102, Psch 255.

398. The Problem of Justice. 4 Hours. Same as Political Science 398 and Religious Studies 398. The premodern view of justice, such as Plato's or Aristotle's; the modern understanding of justice, such as Hobbes's or Locke's, which is the foundation of the modern political regime; Rousseau's seminal political thought on justice, which is the basis for a variety of reforms and alternatives offered to Hobbes's and/or Locke's political regime. Prerequisite: Two courses in political science, including PolS 101 or 151. Hyman, Winter.

399. Independent Study. 2 to 8 Hours. May be repeated for a maximum of 8 hours of credit. Exceptions to this must be approved by the head of the department in writing. For criminal justice majors only. Independent study and research, under the direct supervision of a faculty member, on a subject or subjects not covered in the regular curriculum. Prerequisites: Consent of the instructor, obtained by preregistration in the department office; at least five criminal justice courses, including CrJ 101, 102, 205, 206.

Courses for Graduate Students

400. Systems Concepts: Interaction and Change. 4 Hours. Analysis of the criminal justice system as a system. Interorganization structure, the interaction of component parts, organizational analysis, problem formulation, analytic systems methodology, and planned organizational and systems changes and their consequences. Maltz, Spring.

408. Strategies of Change and Innovation. 4 Hours. Analysis of change and innovation in the criminal justice system from historical and contemporary perspectives. Characteristics of successes and failures in innovation. Programs and goals. Problems and techniques in the evaluation of change.

409. Planned Change in Criminal Justice Organizations. 4 Hours. General review of the notion and theories of planned change on the individual, organizational, and community levels. In-depth analysis of the methods and strategies of change as they apply to the organizations of the criminal justice system. Prerequisite: CrJ 410.

410. Criminal Justice: Process and Institutions. 4 Hours. Critical examination of the criminal justice system. The dynamics and processes of contemporary police, judicial, and correctional institutions are evaluated in the context of key historical developments and relevant research. Morn, Fall.

418. Teaching Criminal Justice. 4 Hours. Development of the ability to recognize the relationships between the three elements of effective teaching: learning objectives; teaching strategy; evaluation procedures found in the field of criminal justice.

420. Police in a Democratic Society. 4 Hours. The inherent conflict between individual liberty and the agency set up for the maintenance of social order. The capacity to use force as the core of the police role; the inadequacy of the "war on crime" and other military models. The pros and cons of present limitations on police in detention, questioning, and search. Critiques of the police. The need for the police to speak out. Prerequisite: CrJ 410. Winter.

438. Forensic Physical Anthropology. 4 Hours. Same as Anthropology 438. Intensive study of human skeletal remains for purposes of personal identification utilizing anthropometric and anthroposcopic techniques. Prerequisite: CrJ 338.

440. Corrections and the Criminal Justice System. 4 Hours. Theoretical and historical consideration of prison confinement and the various societal alternatives studied in the framework of the overall criminal justice system. Historical review of the gaps between conceptual designs and practices. Prerequisite: CrJ 410.

446. Experimenting in Field Settings. 4 Hours. Same as Psychology 446. Problems associated with the collection and analysis of data in natural settings, emphasizing unobtrusive measures and the logic of causal inference based on correlational procedures and quasi-experimental designs. Prerequisite: Consent of the instructor.

449. Legal Limits and the Correctional Process. 4 Hours. The legal structure of the post-adjudicatory criminal justice system. Examination of the major sentencing alternatives and their implications in terms of effectiveness and human rights. Prerequisites: CrJ 470 and concurrent registration in CrJ 440. McAnany, Spring.

460. Forensic Science Laboratory I. 4 Hours. Theory and analysis of criminalistics problems in opinion evidence through examination of materials related to individualization. Methods may include physical and chemical procedures for evaluation, comparison, and particularization. Prerequisite: CrJ 313.

461. Forensic Science Laboratory II. 4 Hours. Advanced instrumental analysis as applied to criminalistics. Simulated crime science evidence is evaluated and alternate instrumental methods are compared. Prerequisite: CrJ 460.

464. Special Topics in Forensic Science. 2 to 4 Hours. Philosophic, moral, and managerial problems associated with forensic science. Quality control of analytical results; human organ transplants and time of death; product liability and physical evidence; changing views of psychiatry, mental health, crime, and control. Prerequisites: CrJ 460, 470.

466. Seminar on Recent Advances in Forensic Sciences. 2 to 4 Hours. Discussion of emerging theories and methods and their application. Subjects may include the role of automated analysis, advances in serology, problems of proof and probability theory, detection methods, systems procedures applied to forensic sciences problems. Prerequisite: CrJ 315.

470. Law and Its Byways. 4 Hours. Laws and law systems that produce definitions of politically cognizable deviance and procedures for the application of definitions in particular cases. Emphasis on the social dynamics that produce laws and law ways. The impact that implementing institutions can have on the interpretation of laws and on future formulations. McAnany, Winter.

478. Discretionary Justice. 4 Hours. The relationship between rules of law and discretionary justice in all components of the criminal justice system. The consequences flowing either from an extravagant insistence on the letter of the law or from an excessive reliance on discretionary power. Methods of confining, structuring, and checking the uses of discretionary power. Prerequisite: CrJ 470.

480. Crime and Social Control. 4 Hours. Analysis of the social

context of crime and delinquency causation and definition. The difference between criminal and noncriminal deviance, the function of legal and quasi-legal norms in various social settings, and theories of crime causation. Carey, Fall.

489. Critical Criminology. 4 Hours. Comparison of one of the better comprehensive descriptions of the criminal justice system with a series of recent critical works that offer alternative conceptions of the system. The assumptions, arguments, supporting data, and differing conclusions of these alternative presentations and evaluation of their adequacy and congruence with experience. Prerequisite: CrJ 480.

490. Research Methodology. 4 Hours. A foundation for subsequent training in more specialized research methods used by social and behavioral scientists. General consideration of research problems and methods; emphasis on systematic research procedures. Diamond, Winter.

493. Criminal Justice Historical Methodology. 4 Hours. Selected topics of crime and criminal justice; historical research methodology. Emphasis on Chicago police, courts, and corrections. Prerequisite: CrJ 410.

495. Evaluation Research in Criminal Justice. 4 Hours. Logic and types of evaluation research. Crime prevention, prosecutorial, and correctional program evaluations and measures of effectiveness of their evaluation. Researcher-agency friction. Prerequisites: A graduate course in research methods and consent of the instructor.

496. Internship in Criminal Justice. 4 to 8 Hours. May be repeated for up to a total of 8 hours; a minimum of 4 hours is required. For students doing research or writing for an internship paper. Prerequisite: Consent of the instructor.

497. Master's Paper Research. 0 to 10 Hours. May be repeated for up to a total of 10 hours of credit. Satisfactory/unsatisfactory grade only. For students doing research or writing a master's paper. Prerequisite: Consent of the instructor.

498. Independent Study or Research. 2 to 12 Hours. Supervised projects, which may consist of extensive readings in criminal justice, research on special problems not included in the regular course offerings, an internship in an agency of criminal justice, or a practicum in a department of criminal justice at a junior or four-year college. Research undertaken for this course may not duplicate that being done for Criminal Justice 499. Prerequisites: Consent of the instructor and approval of the department.

499. Thesis Research. 0 to 16 Hours. May be repeated for up to a total of 16 hours; a minimum of 12 hours is required. Students doing thesis research or writing a thesis register for credit under this number. Prerequisites: Consent of the student's adviser; acceptance of the thesis topic and preliminary thesis outline by the thesis committee.

DOCTOR OF ARTS

Doctor of Arts Faculty

Professors: Susan Markle (Psychology), David Miller (Office of Instructional Resources Development), Richard Videbeck (Sociology)

Associate Professors: Thomas A. DeFanti (Information Engineering), L. Rowell Huesmann (Psychology and Computer Center)

The faculty are appointed to teach core Doctor of Arts courses and to assist in carrying out Doctor of Arts projects. For faculty in the biological sciences, chemistry, mathematics, and physics departments, see the department listings in this bulletin.

The Doctor of Arts is offered in biological sciences, chemistry, mathematics, and physics. The department of the candidate's discipline supervises and directs the programs of Doctor of Arts candidates.

The Doctor of Arts Program provides specialized training in both a discipline and a broad spectrum of related activities ranging from instruction in colleges and universities to the design and administration of educational systems.

The candidate's plan of study is directed and supervised by the discipline department, and competence in the field of specialization equivalent to that required of PhD candidates must be demonstrated. The curriculum couples broad preparation in the discipline—including advanced study in related fields—with specialized training and research in techniques and methods for the transmission of discipline knowledge to college students. The program includes special courses, seminars, laboratory training, and field work covering such topics as educational technology, instructional design, the evaluation of curricula and teaching, and the psychology and sociology of higher education.

Candidates are required to make an original and significant contribution that links their specialized knowledge and training in their discipline with some aspect of the instructional process.

Admission Requirements

Applicants are considered on an individual basis. They must meet the requirements for admission to and be recommended by the department. Consult the department listings in this bulletin for details. In addition, applicants must submit the general verbal and general quantitative test scores on the Graduate Record Examination and three letters of recommendation. At least one letter must comment on the applicant's demonstrated or potential ability as a college teacher and designer of educational materials.

Degree Requirements

Course Requirements. 144 or more quarter hours beyond the baccalaureate degree, distributed as follows:

1. At least 60 quarter hours of course work, of which at least 48 quarter hours are in the major field but exclusive of 499—Thesis Research.
2. At least 32 quarter hours in 499—Thesis Research.
3. At least 20 quarter hours in educational training. This requirement may be met by combining Doctor of Arts 402—Psychosociological Factors in Post-Secondary Education, Doctor of Arts 404—Instructional Design, Doctor of Arts 406—Instructional Technology, or Doctor of Arts 408—Research Methods in Natural Educational Settings with training courses taught in the department. At least one education course must be in the major field.
4. Not more than 8 quarter hours in supervised teaching.

Supervised Teaching. Candidates are required to engage in supervised teaching in their discipline field at Chicago Circle or at a cooperating college or university. Not more than 8 quarter hours of credit for supervised teaching may be counted toward the degree.

Evaluation of Instructional Competence. The candidate's instructional competence is evaluated by a committee of five members appointed by the Dean of the Graduate College on the recommendation of the department and the Doctor of Arts Committee. At least one member of the evaluation committee shall be an instructional specialist. Ordinarily, the evaluation is made at the end of the student's second year. The committee evaluates the candidate's teaching performance and instructional materials. There may be no more than one vote of fail. On the recommendation of the department head and chairman of the committee, the dean may allow a second evaluation.

Preliminary Examination. The preliminary examination, which may be written, oral, or both, tests candidates' grasp of the major and minor fields of their discipline. The timing of the examination is at the discretion of the department but will normally be given no earlier than at the end of the second year of advanced study. For further details, see the section on academic and general regulations and the department listings in this bulletin.

Doctoral Thesis. The candidate must complete and defend a doctoral dissertation. Each department specifies which of the two options the candidate may select.

Option A: The thesis composed of two parts. Part I (at least 16 hours of 499—Thesis Research) is devoted to a research problem within the subject matter of the major discipline and Part II (at least 16 hours of 499) represents an original contribution related to the teaching of a topic within the candidate's major field. Part I of the thesis shall be directed by a member of the graduate faculty of the major department. The candidate defends Part I of the thesis before a committee of at least four persons, of whom two must be permanent members of the Graduate Faculty, and defends Part II of the thesis before a committee composed of at least four persons, of whom two must be permanent members of the Graduate Faculty and at least one must have a special competence in the educational component of the thesis.

Option B: The thesis composed of a single unit (at least 32 hours of 499—Thesis Research). It must make an original contribution related both to instruction in the candidate's major field and to the general body of instructional communication. It is administered as described under Option A, Part II.

Requirements for Holders of Master's Degrees

Students entering the program with a master's degree or other advanced training may petition the Dean of the Graduate College to receive credit for prior work. Such petitions must have the approval of the department and, as appropriate, the Doctor of Arts Committee.

Requirements for Holders of Doctoral Degrees

The Doctor of Arts programs are also open to holders of doctoral degrees who wish to prepare for a career in college teaching and the creation of instructional materials.

Courses for Graduate Students

402. Psychosociological Factors in Post-Secondary Instruction. 4 Hours. Psychological and sociological factors that influence the organization, curriculum, and instructional design of post-secondary educational institutions. Topics include psychological and sociological concepts affecting curriculum and instruction and the role of the disciplines in directing curriculum and instructional decisions.

404. Instructional Design. 4 Hours. Development of principles and practice of course development for graduate students who intend to teach and/or create course materials. Topics include match between subject and student characteristics, use of different instructional approaches, use of different media and the integration of educational technology, the role of tests, and integration of elements.

405. Computer Instructional Systems. 4 Hours. Same as Information Engineering 405. Design structures, computer-assisted instruction; computer-managed instruction; PLATO, TICCIT, and other experimental systems with respect to author languages, use of graphics, system resources, distribution and cost factors. Prerequisite: Graduate standing.

406. Instructional Technology. 4 Hours. Training and laboratory work in computer-assisted instruction and audio-visual instructional materials. Consideration of costs involved and problems of integrating instructional technology into the system in appropriate ways. Specific assignments relevant to the student's major disciplinary area.

408. Research Methods in Natural Educational Settings. 4 Hours. Recording, documenting, analyzing, and reporting evidence of natural events related to education. Statistical design and inferential concepts and techniques. Methods for evaluation of instructional systems, materials, techniques, students, and teachers. Relation of research to planning and implementing change.

ECONOMICS

Richard Kosobud, Head of the Department
Houston H. Stokes, Director of Graduate Studies

Professors: Antonio Camacho, Barry Chiswick, William Grampp, Richard Kosobud, Oscar Miller, George Rosen

Associate Professors: Eliezer B. Ayal, John F. McDonald, Joseph Persky, Houston H. Stokes

Assistant Professors: Jose Alberro, Gilbert W. Bassett, Carson W. Bays, Jr., Carmella Chiswick, Ronald Moses. Mo-Yin Tam, William D. White, David E. Wildasin, Akira Yamazaki

The department offers work leading to the Master of Arts in Economics with specializations in urban and quantitative economics and, in cooperation with the Department of Political Science and the School of Urban Sciences, the Doctor of Philosophy in Public Policy Analysis. Students in the MA program may fulfill part of their degree requirements by taking courses in operations research, statistics, and systems analysis offered by the Department of Quantitative Methods. The economics area specialization of the public policy analysis program provides advanced professional training in the analysis and evaluation of economic policy in such interrelated fields as welfare economics; public administration, finance, and planning; the government's role with respect to the private sector, including health and environmental policies; and economic stabilization policy. Students are expected to acquire the appropriate mathematical, theoretical, and quantitative tools to conduct applied economic research. PPA students in economic policy prepare two areas of concentration, one of which may lie outside the Department of Economics. Students in the economic policy area of the PPA program will meet formal MA requirements usually after one year.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and must submit test scores from the Graduate Record Examination (quantitative and verbal test and the advanced test in economics). Although a minimum score is not required, the admissions committee looks favorably on scores at or above 1,000 for the sum of the verbal and quantitative scores. Students must submit transcripts from all colleges and universities attended.

In exceptional cases, students with averages of less than 4.00 but above 3.75 may be admitted to the MA program if they can show evidence of substantial promise of ability to complete the program successfully. Such students are admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status.

An undergraduate degree in economics is desirable but not required. Students with excellent academic records in other disciplines are encouraged to apply. However, the following courses are required of all applicants, regardless of their undergraduate major: courses in mathematics equivalent to mathematics through introductory calculus; courses in statistics equivalent to statistics through regression analysis; one course in intermediate microeconomic theory and one course in macroeconomic theory.

A proficiency examination in the mathematical and statistical bases of the discipline is required of all candidates at the time of admission. Any deficiency in the above courses must be made up within the first three terms.

* The department will consider applicants for nondegree admission. Applicants will be considered on an individual basis and must submit transcripts from all colleges and universities attended in the last eight years.

Degree Requirements

Master of Arts

Upon admission and in collaboration with the graduate adviser, each student will develop a plan of study. Students must meet both the general requirements of the Graduate College and the requirements specified below. Students who choose the course option rather than the thesis option are not usually able to complete the degree requirements in the summer session. Special requirements apply to students who choose to take some of their work in quantitative methods. They should consult the department listing for details. The requirements for all other students for the MA in Economics follow.

Hours. 48 quarter hours of satisfactory course work, with a minimum of 40 hours in economics, of which at least 20 must be at the 400 level.

The following core of required courses provides the student with a body of knowledge and a grasp of economic methodology that is a base for specialization:

Economics 401—Microeconomics I, 4 hours

Economics 411—Macroeconomics I, 4 hours

Economics 402—Microeconomics II or

Economics 412—Macroeconomics II, 4 hours

Economics 434—Econometrics I, 4 hours

The Department of Economics faculty strongly recommends that the student take Economics 336—Introduction to Mathematical Economics or the equivalent.

Thesis. Students may elect to write an MA thesis, for which they receive up to 12 hours of credit. Credit hours for the thesis may not be included among the 20 required 400-level hours in economics. The thesis may be original research or

a thorough review of a topic based on secondary sources. In either case, competence in the use of economic analysis as well as in the interpretation of results or conclusions is expected of the candidate. The program of students who do not write a thesis (Economics 499) or take an approved internship program (Economics 497) must include 4 hours of either independent study (Economics 497) or the workshop in economics (Economics 498).

Examination. The student must successfully pass a comprehensive written examination based on three core courses in theory. This examination includes one part on Microeconomics I and Macroeconomics I and one part on either Microeconomics II or Macroeconomics II. This comprehensive examination is distinct from the examinations that are given during the courses. A student who fails any of the parts of the examination on two examination dates will not be allowed to take any more examinations.

Doctor of Philosophy

The department offers advanced study in economic policy as part of the PhD in Public Policy Analysis. A minimum of 144 quarter hours of graduate work beyond the baccalaureate, or 96 hours beyond the master's, is required. The plan of study for each student is prepared in consultation with and must be approved by the adviser assigned by the director of graduate studies. It must have five components: core curriculum, two areas of concentration, distribution requirement, professional career training, and dissertation.

Core Curriculum

Each student must take eleven courses distributed as follows:

1. *Methodologies of Public Policy Analysis*: Public Policy Analysis 400—Introduction to Public Policy Analysis.
2. *Research Design for Public Policy Analysis*: one course to be selected from Economics 435—Advanced Econometrics; Political Science 404—Research Design.
3. *Formulation, Implementation, and Evaluation of Public Policy Analysis*: Public Policy Analysis 405—Public Policy: Formulation, Implementation, Evaluation.
4. *Economic Approaches to Public Policy Analysis*: Economics 401 and 402—Microeconomics; Economics 411 and 412—Macroeconomics; Economics 403—Social Choice; and one course from among Economics 413—Monetary and Fiscal Policy; Economics 475—Economic Analysis of Public Expenditures; Economics 414—International Trade Policy; Economics 415—International Monetary Policy; Economics 451—Economics of Education and Income Distribution; Economics 471—Advanced Urban Economics I; Economics 473—Urban Labor Markets; Economics 474—Comparative Urbanization.
5. *Quantitative Analysis*: Economics 434—Econometrics; Economics 436—Advanced Mathematical Economics or Economics 336—Introduction to Mathematical Economics.

Qualifying Examination

Not later than four terms after admission to the program or completion of 48 hours of work (whichever comes first), each student must take a written qualifying examination in economic theory. This examination is the same as given to the MA candidates except that the student must pass at the PhD level all four sections consisting of: (1) basic macroeconomics, (2) basic microeconomics, (3) advanced macroeconomics, (4) advanced microeconomics. The examination is distinct from examinations that are given during the courses. A student who receives a grade of less than PhD pass on any of the parts of the examination on two examination dates

will not be allowed to take any more examinations.

Areas of Concentration

A student must select two areas of concentration, one of which (the minor) may be outside the economics discipline. In consultation with the faculty adviser, the student must select an appropriate sequence of courses to prepare for the preliminary examination, which covers the areas of concentration selected. It is expected that the student's thesis will lie in the general area of the major field of concentration. Currently, three fields of concentration are being offered in the economic policy specialization of the PPA: urban economic policy, economic stabilization and growth policy, and industrial organization policy. A minimum of 24 quarter hours must be taken to satisfy this requirement.

Distribution Requirement

In addition to courses taken under the PPA core curriculum, at least 12 quarter hours of credit must be taken in approved courses outside the Department of Economics.

Professional Career Training

All candidates are required to participate in one of the three programs described below. Professional career training may not begin until the student has completed at least one year of course work. Not more than 12 quarter hours of credit may be applied to the fulfillment of degree requirements.

1. *Internship Option.* The student is assigned to an internship in a public or private agency on a full time basis for at least one term. The field training is in an area related to the student's course work and leads to an analytical research paper on a policy problem that is selected before the student is placed, and agreed on by the student's adviser, the director of graduate studies, and the cooperating agency. This option is strongly recommended for students anticipating careers in government and quasipublic institutions.

2. *Research Option.* The student participates in a research project in collaboration with a faculty member or team of faculty members and students. Projects, and related courses, will focus on an actual problem in public policy analysis, will involve working directly with agencies and organizations related to the problem selected, and will contain a substantial field experience component. The student works as a full research colleague and is involved in all aspects of the project: design, execution, analysis, and report of results. The student will make a formal oral or written presentation on the project's finding.

3. *Outside Minor.* The student selects, with the approval of the faculty adviser, a minimum sequence of at least two courses outside the Department of Economics to prepare a minor field of concentration.

Preliminary Examination

The preliminary examination is normally taken upon completion of the course work and consists of two parts: a comprehensive written examination covering the student's program of study in the two areas of specialization and the student's dissertation prospectus.

The student will be examined by a five-person committee, of whom at least two must be members of the Graduate Faculty, and one must be from outside the department. The committee shall be appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies.

Dissertation

A dissertation is required and must be defended before a committee appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies. The committee shall have at least five members, of whom at least two must be members of the graduate faculty, one must be the candidate's dissertation adviser, and one must be from outside the department. The final version of the dissertation will incorporate any changes recommended by the committee. In most cases, a minimum of 36 hours will be required to prepare a dissertation acceptable to the committee.

Courses for Graduate and Advanced Undergraduate Students

322. Managerial Economics. 4 Hours. Application of economic theory to decision-making in the business firm. Demand and cost analysis, including demand forecasts; price policy of the individual firm; capital budgeting; production analysis; uses of operations research methods. Prerequisite: Econ 318 or 321. Business administration students must have declared a major. Camacho, Tam, Winter.

323. Business Conditions Analysis. 4 Hours. Application of economic theory to analysis of changes in aggregate income and employment; quantitative economic models and their uses in the prediction of aggregate and more refined levels of business activity. Prerequisite: Econ 219 or 221. Business administration students must have declared a major. Kosobud, Stokes, Fall, Spring.

324. Economic History of the United States. 4 Hours. Credit is not given for both Economics 324 and 358. Growth of the American economy from colonial times to the present; special emphasis on contributing forces and factors. Prerequisites: Econ 120, 121 and 8 hours of social sciences. Business administration students must have declared a major.

325. Economic History of Europe. 4 Hours. Evolution of the economic institutions of Europe, beginning with the origins of capitalism; the development of industry, commerce, transportation, finance, and labor. Prerequisites: Econ 120, 121 and 8 hours of social sciences. Business administration students must have declared a major. G. Rosen, White, Spring.

326. History of Economic Thought I. 4 Hours. Evolution of positive and normative economics from the sixteenth to the nineteenth centuries. Prerequisites: Econ 120, 121 and 9 hours of social sciences. Business administration students must have declared a major. Grampp, Spring.

327. Comparative Economic Systems. 4 Hours. Description and analysis of the normative and positive characteristics of capitalism, fascism, democratic socialism, and communism. Prerequisites: Econ 120, 121 and 8 hours of social sciences. Business administration students must have declared a major.

328. Public Finance: Federal. 4 Hours. Theories of public-private resource allocation, principles of taxation, taxes administered at the federal level, federal expenditure programs, debt management. Prerequisite: Econ 218 or 220. Business administration students must have declared a major. Flanagan, Persky, Fall, Spring.

329. Industrial Organization. 4 Hours. The structure of markets; behavior of firms within the market environment; measures of industrial concentration; economics of scale; mergers and the merger movement; price discrimination and tie-in sales; monopoly and cartel arrangements; resale price maintenance; innovation and technological change. Prerequisite: Econ 218 or 220. Business administration students must have declared a major. Bays, Winter.

330. Government and Business. 4 Hours. The rationale and the mechanisms of the social control of business; the effects of government action in influencing the behavior of business firms; the procompetitive policy embodied in the Sherman Act and related legislation. Prerequisite: Econ 218 or 220. Business administration students must have declared a major. Bays, G. Rosen, Spring.

331. Labor Economics. 4 Hours. Economic problems and issues of trade union organization and wage theory; job security, hours, working conditions, labor legislation, unemployment. Prerequisite: Econ

218 or 220. Business administration students must have declared a major. Ghez, White, Winter.

332. Urban Economics. 4 Hours. Same as Geography 333. Survey of economic problems of cities; the nature and function of cities; the demand for and supply of housing and urban land; the implications of location theory for the spatial pattern of cities; the impact of government programs. Prerequisite: Econ 218 or 220 or Geog 330 or UPP 385. Business administration students must have declared a major. McDonald, Persky, Fall.

333. International Economics. 4 Hours. The balance of payments; fixed, flexible, and multiple exchange rates; the forward exchange market; the international trade multiplier; the transfer problem; capital flows; the law of comparative advantage; the gains from trade; tariffs and subsidies; the factor price equalization theorem; international economic communities. Prerequisite: Econ 218 or 220 or 221. Business administration students must have declared a major. Kosobud, Moses, Stokes, Fall.

334. Economic Development. 4 Hours. Same as Geography 332. Basic problems and characteristics of underdeveloped countries; classical, neoclassical, and modern contributions to the theory of development; major proposals for accelerating development; basic approaches to economic development; laissez-faire, interventionism; role and methods of planning; foreign aid; economic integration. Prerequisite: Econ 218 or 220 or 221; or Econ 121, Geog 330. Business administration students must have declared a major. Ayal, G. Rosen, Fall.

336. Introduction to Mathematical Economics. 4 Hours. Application of mathematics to theories of consumer and producer behavior, to the determination of prices in markets, and to growth and stability features of macroeconomic models. Prerequisites: Econ 218 or 220 and Math 112 or 131. Business administration students must have declared a major. Bassett, Camacho, Ghez, Kosobud, Stokes, Tam, Fall, Spring.

341. Location Theory and Spatial Analysis. 4 Hours. Same as Geography 330. Spatial analysis in relation to theories of location of economic activity and regional development; theoretical systems; development and derivation of locational patterns of agricultural, manufacturing, and tertiary activities. Prerequisites: Geog 100 and one course from Geog 230, 231, 233, or Econ 120 and 8 hours of social sciences, or Mktg 360. Business administration students must have declared a major.

342. Regional Economics. 4 Hours. Same as Geography 334. Theory of location of economic activity, land use patterns, systems of cities, the spatial pattern of city regions, regional growth dynamics, interregional transactions analysis, spatial mobility of factors, regional income differences, regional welfare and policy. Prerequisites: Econ 221 and either 219 or 220; or Geog 100, 230. Business administration students must have declared a major. Winter.

343. Geographic Modeling of Transportation Systems. 4 Hours. Same as Geography 335. The principles of spatial interaction; emphasis on commodity flows and passenger movements, the practicality of network analysis, and the impact of transportation facilities on land use and regional development. Techniques include simulation and evaluation of existing transportation systems and solutions to theoretical transportation problems. Prerequisites: Geog 100 and 235 or Econ 120 and 8 hours of social sciences.

344. Areal Organization of Intraurban Systems. 4 Hours. Same as Geography 350. Geographic aspects of intracity relationships. Topics include the city as a complex man-machine system and areal patterns of urban growth and development within the context of cross-sectional and longitudinal models. Prerequisites: One upper-division geographic research methods course, one two-course sequence in systematic geography, one course in either the geography 250 or 360 series; or Econ 332. Business administration students must have declared a major.

345. Advanced Economic Statistics. 4 Hours. Same as Quantitative Methods 345. Probability, hypothesis testing, and estimation, with emphasis on economic applications; econometric models, multiple linear regression, and introduction to problems of estimation. Prerequisites: Math 370 and 372 or QM 172. Business administration students must have declared a major.

346. Econometrics. 4 Hours. Specification of economic models; measurement of variables; estimation of economic relationships and testing of economic hypotheses; single equation problems in estimation; introduction to simultaneous equation estimation. Prerequisites: Econ 219 or 221 and/or 220. Business administration

students must have declared a major. Bassett, Kosobud, Tam, Winter, Spring.

351. Economics of Education. 4 Hours. Concepts of capital applied to human assets; private and social returns to investments in man; application of human capital theory to education, health, income inequality, and other topics. Prerequisite: Econ 218 or 220. Business administration students must have declared a major. Ghez, Fall.

352. Metropolitan Public Finance. 4 Hours. The alternative forms of economic structure employed by state and local governments to raise revenues and allocate resources. Prerequisite: Econ 219 or 220. Business administration students must have declared a major.

358. Economic History of the United States prior to 1900. 4 Hours. Credit is not given for both Economics 358 and 324. Description and analysis of the factors that influenced the path and rate of America's economic development up to 1900. Special emphasis on the economic sources of controversy among the various geographic regions of the nation, the impact of the Civil War and its aftermath on the economy, and the emergence of large-scale industry. Prerequisites: Econ 120, 121 and 8 hours of social sciences. Business administration students must have declared a major. White, Fall.

359. Twentieth-Century American Economic History. 4 Hours. Economic trends and their impact on society from 1890 to the present. Special emphasis on the growing economic importance of government and big business in the economy. Prerequisites: Econ 120, 121 and 8 hours of social sciences. Business administration students must have declared a major. White, Winter.

360. Radical Political Economy. 4 Hours. Fundamentals of Marxist value theory and neo-Keynesian pricing theory. Realization crises and business cycles in competitive and monopoly capitalism. Radical theories of the state and its attempts to influence economic aggregates. Prerequisites: Econ 120, 121 and 8 hours of social sciences.

383. Transportation and Public Policy. 4 Hours. Same as Management 383. The relationship between government and transportation in the United States. Topics include the evolution of transport policy, problems in transport regulation, and current issues in public policy. Prerequisite: Mgmt 380. Business administration students must have declared a major.

390. Special Topics in Economics. 4 Hours. Exploration of an area not covered in existing course offerings; or study in greater depth, or at a more advanced level, of a problem or subject that is covered in an existing course. Subject matter, and sometimes the prerequisites, varies from term to term; prior to registration students should consult the department secretary for further information. Prerequisites: Senior standing and 15 hours of 300-level economics courses. Business administration students must have declared a major.

399. Independent Study in Economics. 2 to 5 Hours. May be repeated once for credit. For students who wish to do independent study in an area not covered by existing course offerings or to explore in greater depth a problem or subject covered in a previously taken course. Prerequisites: 15 hours of 300-level economics courses and consent of both a faculty member and the head of the department. Business administration students must have declared a major. Staff, Fall, Winter, Spring.

Courses for Graduate Students

400. Managerial Economics. 4 Hours. Economic analysis applied to business operations; theory of production and cost analysis; capital theory; pricing of products and factors. Prerequisites: Econ 220, 221, Fin 341.

401. Microeconomics I. 4 Hours. Theories of consumer and producer behavior and determination of market price. Systematic treatment of the core of microeconomic theory. Prerequisite: Econ 220. Ayal, Camacho, Ghez, Fall.

402. Microeconomics II. 4 Hours. Axiomatic approach to the theory of exchange; general equilibrium analysis; welfare economics; capital theory. Prerequisite: Econ 401. Camacho, Ghez, Winter.

403. Nonmarket Decision-Making. 4 Hours. The analytics of group decisions. Some of the most common group-decision rules are examined in reference to the "voting paradox" or its generalization, the impossibility theorem. The problem of ordinal versus cardinal utility is discussed in the context of social choice. Prerequisite: Econ 401.

411. Macroeconomics I. 4 Hours. Static and dynamic theories of income and employment; advanced treatment of consumption and

investment functions; aggregate production functions; trade cycle and growth; stabilization; theory and policy. Prerequisite: Econ 221. Kosobud, Moses, Stokes, Fall.

412. Macroeconomics II. 4 Hours. Survey of recent research on the determination of employment, the price level, growth rates, and balance of payments variables; current theoretical approaches to these problems; policy proposals. Prerequisite: Econ 411. Kosobud, Moses, Stokes, Winter.

413. Monetary and Fiscal Policy. 4 Hours. Appropriate use of monetary and fiscal policy under fixed and flexible exchange rates at different phases of the business cycle; impact multipliers and the appropriate mix of monetary and fiscal policy for growth and stability. Prerequisite: Econ 411. Stokes, Moses, Kosobud.

414. International Trade Policy. 4 Hours. Analysis of the effect of tariff and nontariff policy on the flow of trade and the distribution of income within and between countries; the policy implications of factor price equalization; the stability conditions for balance of payments equilibrium. Prerequisite: Econ 401. Stokes, Moses, Kosobud.

415. International Monetary Policy. 4 Hours. Capital mobility and stabilization policy under fixed and flexible exchange rates; optimum currency areas; reform of the international monetary system; problems of liquidity adjustment and confidence. Prerequisite: Econ 411. Stokes, Moses, Kosobud.

425. Business Conditions Analysis. 4 Hours. Applications of micro- and macroeconomic theory to economic fluctuations and the problems caused by them. Topics in forecasting and stabilization policy. Prerequisite: Econ 411.

426. History of Economic Thought II. 4 Hours. Economic ideas from the period of mercantilism to the Lausanne school, including physiocracy, classical and neoclassical economics, marginal analysis, and Marxism. Prerequisite: Econ 326. Grampp.

434. Econometrics I. 4 Hours. Detailed treatment of the multivariate linear regression model using matrix algebra. Emphasis on formulating and testing static and dynamic econometric models. Prerequisite: Econ 345. Bassett, Kosobud, Winter.

435. Advanced Econometrics. 4 Hours. Detailed treatment of simultaneous equation estimation; evaluation of alternative estimators; problems in estimation; survey of selected large-scale econometric models. Prerequisite: Econ 345. Bassett, Kosobud, Stokes, Spring.

436. Advanced Mathematical Economics. 4 Hours. Illustrations of applications of the calculus and linear algebra to elementary theories of consumer and producer behavior and to price formation in markets. Applications in macroeconomics. Prerequisite: Math 131 or the equivalent. Camacho, Kosobud, Spring.

437. Business Research and Forecasting. 4 Hours. Same as Quantitative Methods 475. The role of research in business; forecasting methods and techniques, including models and their applications. Prerequisite: QM 472 or Econ 434.

450. Advanced Statistics. 4 Hours. Same as Quantitative Methods 450. In-depth presentation of statistical methodology including underlying theory and practical applications. Distribution theory, estimation and testing of hypotheses, nonparametric methods, contingency tables, analysis of variance, regression and correlation analysis, applications of statistical methodology to economic forecasting, bio-assay, control charts, life testing. Prerequisite: QM 172 or equivalent.

451. The Economics of Education and Income Distribution. 4 Hours. Same as Education 473. Basic concepts and tools of economics applied to individual and public decision-making in the area of education. Analysis of monetary and nonmonetary returns to schooling. Discussion of costs of education, and educational production functions. Impact of education on income distribution and growth. Prerequisite: Consent of the instructor.

460. Industrial Organization. 4 Hours. Analysis of industry structure, behavior, and performance; firms in imperfect competition; concentration measurement; oligopoly theory; cartels; price discrimination; vertical and horizontal integration. Prerequisite: Econ 218 or 220 and 221 or the equivalent. Bays.

471. Advanced Urban Economics I. 4 Hours. Urban economic models. Topics include hypotheses of firm location, urban housing and transportation, and optimal city size. Prerequisite: Econ 401. McDONALD, Persky, Wildasin, Winter.

472. Advanced Urban Economics II. 4 Hours. In-depth economic

analysis of urban problems. Topics include urban macroeconomic analysis, the urban public sector, labor markets in urban areas, and the economic causes of poverty. Prerequisite: Econ 471. McDonald, Persky, Wildasin, Spring.

473. Urban Labor Markets. 4 Hours. Economic analysis of the determinants of the job allocation process and the resulting income distribution in urban areas. The roles of industrial structure, education, unionization, and discrimination. The economic impact of major government programs. Prerequisite: Econ 220 or the equivalent. Ghez, Persky.

474. Comparative Urbanization. 4 Hours. The process of urbanization in different economic and social contexts. Models of urban growth are applied to economic development, and such concepts as urban primacy, city-size distribution, urban hierarchy, core, and periphery are explored; international trade theory will be applied to urban specialization. Empirical studies of urbanization in different countries are used to examine the applicability of the theoretical models; the central issues of urban planning and such policy questions as congestion and pollution. Prerequisite: Econ 401. Ayal, Spring.

475. Economic Analysis of Public Expenditures. 4 Hours. Microeconomic theory as applied to public expenditure decisions; planning-programming-budgeting systems, regulation of the use of unpriced resources, and cost-benefit analysis with extensive illustrative case studies, including urban transportation, urban renewal, water resource management, pollution control, and job-training programs. Prerequisite: Econ 401. McDonald.

496. Internship Program in Urban and Quantitative Economics. 0 to 12 Hours. The maximum hours allowed for Economics 496, 497, 498, and 499 combined may not exceed 16 hours. Under the direction of a faculty supervisor, students work in a government or private firm on problems related to their major field of interest. Specific credit allotted is determined by the Graduate Curriculum Committee after receiving the supervisor's recommendation. Prerequisites: Approval of the internship program by the graduate adviser and the Graduate Curriculum Committee; completion of all course work for the Master of Arts program in urban and quantitative economics. Staff, Fall, Winter, Spring.

497. Independent Study in Economics. 2 to 5 Hours. May be repeated once for credit. The maximum hours allowed for Economics 496, 497, 498, and 499 combined may not exceed 16 hours. Independent study under the direction of a faculty member. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

498. Workshop in Economics. 4 Hours. May be repeated once for credit with the consent of the instructor. The maximum hours allowed for Economics 496, 497, 498, and 499 combined may not exceed 16 hours. A workshop seminar; students and faculty present the results of their research on any special topic in economics. Each participant is required to research a topic or problem and present an acceptable paper on his method and results. Participants criticize and evaluate the materials presented. Prerequisite: Econ 401 or 411. Kosobud, Stokes, Spring.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. The maximum hours allowed for Economics 496, 497, 498, and 499 combined may not exceed 16 hours. Students present the results of their thesis research. Prerequisite: Approval of thesis prospectus by the thesis committee. Staff, Fall, Winter, Spring.

EDUCATION

Maurice J. Eash, Dean of the College of Education and Director of Graduate Studies

Professors: Maurice J. Eash, Thomas E. Linton, Julius Menacker, Van Cleve Morris, Harriet Talmage, Herbert J. Walberg

Associate Professors: Tanis H. Bryan, Patricia S. Charlier, Robert L. Crowson, Jr., Rheta DeVries, Emanuel Hurwitz, James V. Kahn, Constance Kamii, Ernest Pascarella, Susanna W. Pflaum, Philip W. Tiemann, Donald R. Warren, Edward Wynne

Assistant Professors: F. David Boulanger, Neal J. Gordon, Donna C. Hetzel, Dale E. Layman, Larry Nucci, Rosita A. Pengson, Cynthia K. Porter-Gehrie, Joel S. Richman, William H. Schubert, Ward W. Weldon

Master of Education

The College of Education offers a program leading to the Master of Education with three areas of specialization.

Instructional Leadership

(a) *Early Childhood Education:* Prepares students in child-development methods for pre-primary teaching by focusing on the social, emotional, physical, and cognitive development of young children. Special emphasis is placed on implementing Piaget's theory in the classroom.

(b) *Programs for Schools and Institutions:* Emphasizes the development of instructional leadership ability in the classroom teacher, especially skill in managing institutional resources, initiating and implementing new programs, and encouraging innovation in instructional methods and materials.

(c) *Reading:* Prepares students to design, implement, and evaluate schoolwide developmental reading programs. In addition, students may elect an optional area of study in remediation and research or in language and its impact on the process of reading.

Special Education

Presents unique needs of children with learning disabilities, behavior disorders, mental retardation, and hearing impairments. Emphasis is on developing the student's ability to diagnose these needs and implement effective instructional programs.

Policy and Evaluation Research

(a) *Policy Analysis:* Focuses on the social and political dimensions of schools with emphasis on administrative techniques for initiating and implementing educational programs in urban schools. Completion of this area satisfies, in part, requirements for administrative endorsement in Chicago public schools. Students who seek State of Illinois administrative endorsement enroll in a special program conducted jointly by UICC and Loyola University of Chicago. For information consult the head of the Department of Policy Studies, College of Education.

(b) *Evaluation Research:* Prepares students to be specialists in educational measurements, curriculum evaluation, educational and psychological statistics, and computer programming as these relate to program design and evaluation.

Field-based study is a feature of the program and provides students with an opportunity to analyze the forces that shape

urban education. Involvement in some formal or informal teaching or administrative assignment, at least on a part-time basis, may be required of degree candidates.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 3.75 (A=5.00) for the final 90 quarter hours (60 semester hours) of study. Students admitted to the program may be asked to complete one or more courses to satisfy requirements in education policy studies, the learning process, curriculum and instruction, educational evaluation, and the teaching of reading. Such students will be placed on limited status until deficiencies are remedied.

Applicants should submit transcripts from all colleges and universities attended.

Additional Admission Requirements for Areas of Specialization

Instructional Leadership

(a) *Early Childhood Education*

1. At least one year of teaching experience at the preschool or kindergarten level
2. A short paper in response to questions available from the Office of Graduate Studies, College of Education

(b) *Programs for Schools and Institutions*

1. At least one year of teaching experience (or comparable work in such fields as recreation and program development).
2. Previous course work in education policy studies or the learning process, in curriculum and instruction or evaluation, and in reading.

(c) *Reading*

1. At least one year of teaching experience.
2. Previous course work in reading and in two of the following: education policy studies, the learning process, curriculum and instruction, or evaluation—or current teacher certification.

Special Education:

Completion of the course Education 310—Survey of Characteristics and Education of Exceptional Children or its equivalent; completion of a course on methods of teaching reading.

Policy and Evaluation Research:

(a) *Policy Analysis*

No additional admission requirements.

(b) *Evaluation Research*

1. Miller Analogies Test (raw score of at least 55).
2. Doppelt Mathematical Reasoning Test (raw score of at least 25).

Nondegree Admission

An applicant who is interested in taking courses in education but does not wish to pursue a degree program should submit proof of a baccalaureate (e.g., official transcript, letter from registrar).

Degree Requirements

Degree requirements vary according to the area of specialization chosen. However, all candidates must complete 16 quarter hours at the 400 level, of which at least 8 must be in

regularly scheduled courses (excluding independent study). The requirements for each area of specialization are as follows:

Instructional Leadership:

(a) *Early Childhood Education*

1. *Core curriculum.* 12 quarter hours, distributed as follows: Education 302 or 303; 322; 330 or 331.
2. *Area of specialization.* 24 quarter hours required of all students: Education 323, 329, 350, 420, 421.
3. *Electives.* 12 quarter hours.

(b) *Programs for Schools and Institutions*

1. *Core curriculum.* 12 quarter hours, distributed as follows: Education 302 or 303; 321 or 322 or 345; 330.
2. *Area of specialization;* 24 quarter hours required of all students: Education 331, 390, 430 or 431, 432, 439.
3. *Electives.* 12 quarter hours.

(c) *Reading*

A minimum of 48 or 50 quarter hours is required for the degree, depending on the optional course sequence selected by a student as part of the area of specialization.

1. *Core curriculum.* 16 quarter hours, distributed as follows: Education 302 or 303; 321 or 322 or 345; 330 or 331; 390.

2. *Area of specialization.* 30 or 28 quarter hours, including: Required of all students—16 quarter hours Education 360, 432, 469

and

Option I. Research and Evaluation of Reading—14 quarter hours: Education 463, 464, 465, and 466

or

Option II. Language and Reading—12 quarter hours: Education 464; two of the following: Communication and Theater 303, Linguistics 305, English 383, Communication and Theater 404, or related courses approved by the student's adviser.

3. *Electives.* 4 quarter hours.

Special Education:

1. *Core curriculum.* 12 quarter hours, distributed as follows: Education 302 or 303; 321 or 322 or 345; 330.

2. *Area of specialization.* 20 or 32 quarter hours, depending on the optional course sequence selected by a student as the area of specialization, including:

Option I. General Studies in Special Education—20 quarter hours:

Education 324, 325, 326, 418

One additional course in special education

or

Option II. Certification in Special Education—36 quarter hours:

20 quarter hours required in Option I

8 quarter hours in specific area of exceptionality (learning disabilities, mental retardation, or emotional disturbance)

Education 438.

3. *Electives:* Option I—16 quarter hours; Option II—none.

Policy and Evaluation Research:

(a) *Policy Analysis*

1. *Core curriculum.* 16 quarter hours, distributed as follows: Education 302; 303; 321 or 322 or 345; 390.

2. *Area of specialization.* 24 quarter hours required of all students: Education 335, 440, 450, 452, 459.

3. *Electives.* 12 quarter hours selected from the following courses: Education 306, 401, 402, 444, 468 (upon petition a student may substitute for one of the above electives a course from: Education 344, 360, 400, 441, 442, 443, 451, 460).

(b) *Evaluation Research*

1. *Core curriculum*. 16 quarter hours distributed as follows: Education 302 or 303; 321 or 322 or 345; 330 or 331; 390.
2. *Area of specialization*. 20 quarter hours required of all students: Education 445, 446, 447, 448.
3. *Electives*. 12 quarter hours.

Doctor of Philosophy

The College of Education also offers advanced study in education policy as part of the PhD in Public Policy Analysis. Students select from two areas of specialization: (1) education policy analysis and administration and (2) evaluation research and program design. Both areas of study require knowledge of the historical, social, and intellectual influences on education; significant policies affecting educational practice; and the theories that inform education policy research and planning. Students are expected to develop quantitative and documentary research skills and to acquire appropriate evaluation and analytical tools. Courses in education policy analysis and administration emphasize the political, economic, cultural, and legal contexts of education policy, including historical and intellectual influences, organization and administration theory, and educational management. Courses in evaluation research and program design emphasize analysis of educational data, assessment of teaching strategies and learning outcomes, and program design and evaluation. The two education policy specializations prepare individuals for careers as research, planning or administrative personnel in educational institutions or agencies, or as university faculty.

Admission Requirements*Regular Admission*

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. A statement of professional goals and three letters of recommendation from faculty members or others familiar with the applicant's training, ability, and experience are also required. Applicants must submit scores on the Graduate Record Examination (verbal and quantitative tests). With the permission of the director of graduate studies, applicants may substitute verbal and quantitative aptitude test scores from the Law School Admission Test or other comparable tests. Applicants are encouraged, but not required, to submit scores from the advanced GRE test in such policy-related fields as economics, engineering, geography, history, political science, psychology, or sociology.

In exceptional cases, applicants with grade point averages of less than 4.00 but above 3.75 may be admitted if they can show substantial evidence of their ability to complete the program successfully. Such students will be admitted on limited status.

The program accepts the minimum Graduate College requirements regarding the submission of transcripts (p. 31).

Nondegree Admission

A limited number of nondegree students will be admitted each year. Applicants must submit a transcript from the institution that awarded their most recent degree and supply a letter stating why they feel nondegree admission would be beneficial to them. Nondegree students must satisfy all prerequisites for courses they plan to take.

Degree Requirements

A minimum of 156 quarter hours of graduate work beyond the baccalaureate or 120 quarter hours beyond the master's degree is required. The plan of study for each student is prepared in consultation with and must be approved by the faculty adviser assigned by the director of graduate studies. All students are required to complete the core curriculum, appropriate work in the area of specialization, at least 12 quarter hours of credit outside the College of Education (distribution requirement), professional career training, and a doctoral dissertation. At least 32 quarter hours of work in the specialization must be at the 400 level.

Core Curriculum

1. Methodologies for policy research: Public Policy Analysis 400—Introduction to Public Policy Analysis.
2. *Research design*: Education 445—Educational Evaluation Design and Methods I or Political Science 404—Research Design for Public Policy Analysis; and Education 470—Education Policy: Historical and Philosophical Analysis.
3. Quantitative analysis: Education 446—Educational Measurement; Education 483—Analysis and Interpretation of Educational Data.
4. Economic policy: one course chosen from Economics 401—Microeconomics I; Economics 403—Nonmarket Decision-Making; Economics 411—Macroeconomics I.
5. Program design: Education 474—Curriculum and Program Design.
6. Public policy formulation, implementation, and evaluation: Public Policy Analysis 405—Public Policy: Formulation, Implementation, Evaluation.

Qualifying Examination

Not later than four terms after admission to the program or the completion of 48 quarter hours of work (whichever comes first), each student must take a written qualifying examination covering the core requirements. A student who fails on the first attempt may petition to take the examination a second time. A third examination is not permitted. The qualifying examination is offered twice during the academic year.

Distribution Requirement

In addition to the core curriculum, students must complete at least 12 quarter hours of work outside the College of Education. Courses must be approved by the faculty adviser.

Education Policy Analysis and Administration

	<i>Minimum Hours with master's</i>	<i>Hours without master's</i>
Core curriculum	32	32
Specialization requirement		
Distribution courses	12	24
Specialization courses	28	44
Education electives	—	8
Professional career training	12	12
Dissertation	36	36
<i>Total</i>	120	156

Evaluation Research and Program Design

	<i>Minimum Hours with master's</i>	<i>without master's</i>
Core curriculum	32	32
Specialization requirement		
Distribution courses	12	24
Specialization courses (including Education 447, 475, 477)	28	44
Education electives	—	8
Professional career training	12	12
Dissertation	36	36
<i>Total</i>	120	156

Professional Career Training

All candidates are required to participate in one of the three programs described below. This professional career training may not begin until the student has completed at least one year of course work. Not more than 12 quarter hours of credit may be applied to the fulfillment of the degree requirements.

1. *Internship Option.* The student is assigned to an internship in a public or private agency on a full-time basis for at least one term. The field training leads to an analytical research paper on a policy problem selected before the student is placed, and agreed on by the student's adviser, the director of graduate studies, and the cooperating agency. This option is strongly recommended for students anticipating careers in government and other public or quasipublic institutions.

2. *Teaching Option.* The student enrolls in a course that explores different teaching philosophies and methodologies and will be assigned to participate in undergraduate instruction for at least one term. The assignment may involve independent responsibility for an introductory course including the selection of texts, preparation of a course syllabus, student evaluation, and assignment of grades. Alternatively or additionally, a candidate may be assigned joint responsibility with a faculty member for an advanced undergraduate course. The student would be involved in all aspects of planning, teaching, and evaluating and would participate on a collegial basis with a faculty member. Each student will complete a paper on the theory and methodology of teaching, the design of a course, or the evaluation of a course.

3. *Research Option.* The student participates in a research project in collaboration with a faculty member or team of faculty members and students. Projects will focus on an actual problem in public policy analysis, will involve working directly with agencies and organizations related to the problem selected, and will contain a substantial field experience component. The student works as a full research colleague and is involved in all aspects of the project: design, execution, analysis, and reporting results. The student will make a formal presentation, oral or otherwise, on the project's findings.

Preliminary Examination

The preliminary examination is normally taken upon completion of the course work and consists of two parts: a comprehensive written examination covering the student's program of study in the area of specialization and an oral examination covering both the student's program in the area of specialization and the student's dissertation prospectus.

The student will be examined by a five-person committee, of whom at least two must be members of the graduate faculty, and one must be from outside the area of specialization. The committee shall be appointed by the Dean of the Gradu-

ate College on the recommendation of the director of graduate studies.

Dissertation

A dissertation is required and must be defended before a committee appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies. The committee shall have at least five members, of whom at least two must be members of the graduate faculty, one must be the candidate's dissertation adviser, and one must be from outside the area of specialization. The final version of the dissertation will incorporate any changes recommended by the committee.

Courses for Graduate and Advanced Undergraduate Students

300. **Issues in Urban Education Policy and Planning. 4 Hours.** Same as Urban Planning and Policy 300. Major areas of conflict—such as race and ethnic relations, school governance, equality of opportunity, teacher bargaining, neighborhood control—that affect education in metropolitan areas. Emphasis on an understanding of the historical background and the current status of the selected issues and their implications for education policy and planning. Prerequisite: Consent of the instructor. Spring.

301. **Educational Policy in Urban America. 4 Hours.** Examination of selected urban phenomena in relation to educational bureaucracies and school socialization processes. Emphasis on historical investigation of strategies for protest and change employed by ghetto populations; conditions that fostered these strategies; responses of schools and other target institutions; social-philosophical analysis of ideologies supporting both protest and response. Winter.

302. **Philosophy of Education and Urban School Policy. 4 Hours.** Same as Urban Planning and Policy 302. Systematic exploration of selected educational theories and philosophies; particular emphasis on their impact on the problems of formulating urban educational policy. Areas of special concern: serving pluralistic interests, curriculum design, school organization, and school control. Fall, Winter, Spring, Summer.

303. **Policy Issues in the History of American Education. 4 Hours.** Same as Urban Planning and Policy 303. Topical analysis of political, economic, and cultural influences shaping the development of American education policy; emphasis on issues of education theory and practice in their historical settings. Fall, Winter, Spring, Summer.

304. **Practicum in Early Childhood Education. 4 Hours.** Field placement in a child development center under the supervision of an approved qualified teacher. Experience in planning activities, evaluating the developmental progress of the children, and methods of child management. Weekly seminars to discuss the work. Prerequisite: Ed 210 or 250 or Psch 220. Spring.

305. **Educational Policy for Citizens. 4 Hours.** Same as Social Work 305. The concepts and information that all citizens need to participate effectively as education consumers and policy affectors. History, economics, basic statistics, sociology, research, and current and future trends affecting American education at all levels. Prerequisite: Consent of the instructor.

306. **The Politics of Urban Education. 4 Hours.** Same as Political Science 340 and Urban Planning and Policy 306. Relations between school governance and urban politics. Particular attention to the role of educational interest groups, the school board, professional educators, citizens, and civic leaders in the formulation of educational policy. Prerequisite: Consent of the instructor. Winter.

307. **Alternative Educational Systems. 4 Hours.** Same as Urban Planning and Policy 307. Selected systems within and outside the public school system. Emphasis on origins, nature, and potential eventualities, including impact on the public schools. Prerequisite: Consent of the instructor. Fall.

310. **Survey of Characteristics and Education of Exceptional Children. 4 Hours.** Development and organization of special education programs for children who have learning disabilities, emotional and behavior disorders, or impaired hearing or who are educationally

mentally retarded. Screening techniques, referral processes, educational objectives, and program structure. Prerequisite: Ed 321; or graduate standing and consent of the instructor. Fall, Winter, Summer.

311. Introduction to Children with Learning Disabilities. 4 Hours. Principal theories of learning and language disorders, language development, remediation of learning and language deficiencies, and the utilization of various communication techniques in the remedial education process. Prerequisites: Ed 310 and consent of the instructor. Fall, Spring.

312. Educational Methods for Children with Learning Disabilities. 4 Hours. Development of educational programs related to specific learning disabilities, including instructional methods and materials. Prerequisite: Ed 311. Winter, Summer.

313. Introduction to Mental Retardation. 4 Hours. The nature, characteristics, and educational implications for the cognitive, social, and physical development of the retarded child in the educational setting. Prerequisites: Ed 310 and consent of the instructor. Fall.

314. Methods of Instruction for the Educable Mentally Retarded. 4 Hours. The organization and content of public school programs; emphasis on selecting, developing, and adapting teaching materials and techniques. Principles of parent counseling; survey of community services. Prerequisite: Ed 313. Winter, Spring.

315. Educational Development and Program Planning for the Emotionally Disturbed and Socially Maladjusted Child. 4 Hours. The nature, characteristics, and educational implications for cognitive, social, and physical development within the school setting. Prerequisites: Ed 324, Psch 280 or the equivalent, and consent of the instructor. Fall.

316. Methods of Teaching the Disturbed and Maladjusted Child. 4 Hours. Specific behavioral management techniques for classroom use. Development of curriculum, methods, and materials appropriate for disturbed children in an educational setting. Prerequisite: Ed 315. Winter.

317. Language Concepts for the Hearing-Impaired Intermediate and Secondary Student. 5 Hours. Theoretical and educational aspects of language and language concepts utilized at the intermediate and high school levels. Prerequisite: Consent of the instructor.

318. Drug Education for Educators. 4 Hours. Background information, methods, and materials for teaching drug education and working with faculty, students, and parents in drug-related problems. Prerequisite: Graduate standing or consent of the instructor. Fall, Winter, Spring.

319. Clinical Experience in Remedial Teaching. 4 Hours. Demonstrations by students of the ability to diagnose, prescribe, and develop a remedial program. Utilization of educational clinic and field internship experience with handicapped children in an educational setting. Prerequisites: Acceptance in advanced-level special education courses and consent of the instructor.

320. Social Development of Urban Children. 4 Hours. The general principles of social learning and socialization during childhood and the factors common to urban children that illustrate and modify these principles. Classroom observation of children and interviewing are required. Prerequisite: Psch 220 or the equivalent by consent of the instructor. Winter.

321. Advanced Educational Psychology. 4 Hours. Psychological theories and principles of learning as they apply to the teaching-learning process. Particular attention to the investigation of central concepts of the psychology of learning in the urban classroom. Prerequisites: Ed 210, 250; or graduate standing and consent of the instructor. Fall, Winter, Spring, Summer.

322. Advanced Developmental Psychology and Educational Processes. 4 Hours. Normal growth stages in language, physical growth, cognitive development, and social behavior from birth through adolescence; their relationship to major theories and to educational planning and practice. Prerequisites: Psch 101 and any one of Ed 210, Psch 224, or Psch 258; or graduate standing and consent of the instructor. Fall, Winter, Spring, Summer.

323. Curricula in Early Childhood Education. 4 Hours. Survey of curricula in the field of early childhood education; special emphasis on underlying theoretical rationale pertaining to the nature and course of child development and learning. The problem of criteria for evaluating differential effectiveness. Prerequisite: Ed 224. Spring.

324. Differential Diagnosis of Learning and Behavior Problems. 4

Hours. Characteristics of children with learning and behavioral problems. Theoretical basis for diagnosis and remediation of learning and behavior disorders. Prerequisites: Ed 310 and consent of the instructor. Fall, Winter, Spring, Summer.

325. Behavioral Management Theory and Technique. 4 Hours. Utilization of behavior modification training and applied techniques in classroom management in the education of children with learning and behavior difficulties. Prerequisite: Ed 310. Fall, Winter, Spring, Summer.

326. Prescriptive and Remedial Teaching in Special Education. 4 Hours. Various techniques for the remediation of learning and behavioral problems; application of these methods to a wide variety of school learning and behavior problems. Demonstrations by students of their ability to assess and plan successful remedial programs for individual children. Prerequisites: Ed 324, 325. Fall, Winter, Spring, Summer.

327. Art Media and Their Utilization with the Handicapped Child. 4 Hours. Theoretical basis for utilization of art media with the handicapped. Student demonstrations of specific art media competencies in an applied setting with handicapped children. Prerequisite: Ed 326.

328. Perceptual Motor Education and the Handicapped Child. 4 Hours. The interaction between exceptional children's learning abilities and their perceptual motor development and skills. Seminar; student demonstrations of specific physical education and recreation competencies. Prerequisite: Ed 326.

329. The Theory of Jean Piaget. 4 Hours. Same as Psychology 329. Jean Piaget's genetic theory of the development of knowledge. His studies of cognitive development in children, especially his views on memory, learning, and intelligence. Educational implications. Prerequisites: Psch 101 and either Ed 210 or Psch 258; or graduate standing and consent of the instructor. Fall.

330. Curriculum, Instruction, and Evaluation in Urban Education I. 4 Hours. A laboratory-discussion course; emphasizes the changing role of education in urban society and the implications of changes on curriculum decision-making, design, instruction, and evaluation. Prerequisite: One methods course; or graduate standing and consent of the instructor. Fall, Winter, Spring, Summer.

331. Improving Learning Environments. 4 Hours. Development of the basic skills and the understanding necessary to bring about productive changes in a school system; the skills are developed in conjunction with a plan for improving a specific learning environment. The consequences of change in the school as a social system. Prerequisite: One methods course; or graduate standing and consent of the instructor. Winter, Spring, Summer.

332. Issues in Secondary Curriculum. 4 Hours. Analysis of selected issues; investigation of viewpoints in related literature; field investigations when pertinent. Specialists are invited. Prerequisite: Ed 230 or a methods course offered in the student's major department or graduate standing.

333. Topics in Curriculum, Instruction, and Evaluation. 1 to 12 Hours. May be repeated for up to 12 hours of credit. Workshop in selected topics; special application to classroom organization and instruction. Each topic is announced at the time the class is scheduled. Prerequisite: Classroom teaching experience. Fall, Winter, Spring, Summer.

335. Educational Supervision: Theory and Practice. 4 Hours. Theory and practice of existing and emerging models of supervision are examined in terms of supervisory roles, interpersonal relationships, evaluation of supervision, and skills in collecting, analyzing, and sharing current practices. Prerequisite: Ed 330 or 331. Winter, Summer.

341. Curriculum Methods and Materials for the Trainable Mentally Handicapped. 4 Hours. Appropriate curriculum, instructional methods, and materials; behavioral and academic objectives; instructional theory and techniques. Prerequisite: Ed 313. Winter.

342. Development and Disorders of Language. 4 Hours. Principal theories of learning and language disorders, language development, remediation of learning and language deficiencies, and the utilization of various communication techniques in the remedial education process. Prerequisite: Ed 291 or 341. Spring.

343. Teaching Language to the Deaf. 4 Hours. Methods for developing language competencies in preschool and elementary school age hearing-impaired children. Prerequisite: ComTh 171 or Ed 211 or the equivalent. Fall.

344. Mental Hygiene. 4 Hours. Approaches in school, home, industry, and multicultural community. Individual and group procedures for assessment of problems in personal-social growth; followup planning, decision-making, and evaluation. Self-study; applications and various models of interdisciplinary consultation, especially in metropolitan areas. Prerequisite: Graduate standing or consent of the instructor. Fall.

345. Adolescence and the Schools. 4 Hours. Biological, psychological, and social development in adolescence in relation to educational issues. Field study involving observations and interviews of adolescents is required. Prerequisite: Ed 210 or graduate standing and consent of the instructor. Winter.

349. History and Philosophy of Early Childhood Education. 4 Hours. The history and philosophical foundations underlying current thought and practice; emphasis on the effects of changing values, views of human development, and economic, political, and social conditions. Prerequisite: Ed 210; or graduate standing and consent of the instructor. Fall.

350. Guidance in Early Childhood. 4 Hours. For teachers of young children. Introduction to the principles and methods of guidance and counseling of young children and their families. Prerequisite: Ed 212 or graduate standing, and consent of the instructor. Winter.

353. Topics in Education Policy. 1 to 12 Hours. May be repeated for up to 12 hours. Workshop; emphasis on issues related to school organization, control, and community relations. Topics are announced at the time the class is scheduled. Fall, Winter, Spring, Summer.

354. Teaching Reading to the Deaf. 4 Hours. The relationship between reading and prelingual deafness. Evaluation of linguistics and experimental readiness for beginning reading; the development of appropriate techniques for differential instruction with the deaf, including selection of appropriate texts and the preparation of materials. Prerequisites: Ed 261, 343. Fall.

355. Teaching Speech to the Deaf. 4 Hours. Methods for developing and maintaining intelligible speech in children with moderate to profound hearing impairments; the use of electronic aids for developing auditory and motor phonetics; cybernetic mechanisms. Prerequisite: Ed 343. Spring.

356. Teaching Communication to the Deaf. 8 Hours. Prescriptive methods for developing viable communication skills with the deaf. Techniques for utilization of residual hearing through group and individual amplification. Laboratory and practicum experience in speechreading, the language of signs, and total communication. Prerequisite: Credit or concurrent registration in Ed 355. Winter.

358. Guidance for the Hearing-Impaired. 4 Hours. Survey of guidance theories and practices; their application to the hearing-impaired and their families. Prerequisite: Ed 310 or the equivalent. Fall, Summer.

359. Educational Audiology. 6 Hours. Speech and pure tone audiometry and its use in evaluating the effect of hearing impairment on language development, communication ability, and school achievement; special attention to the appraisal of methods and instrumentation for individual and group amplification. Prerequisite: Ed 284 or 358. Spring.

360. Differentiated Reading Instruction. 4 Hours. Measurement of language and reading strengths; diagnosis of weaknesses; development of materials and techniques to individualize reading instruction to remediate and enrich. Prerequisites: Ed 262 or 265 or the equivalent and consent of the instructor. Fall, Winter, Spring, Summer.

361. Corrective Reading Instruction. 4 Hours. Informal instruments for assessing pupil needs in reading diagnosis of test results for instructional direction; planning and teaching on a one-to-one basis; evaluation of pupil growth through post-tests. Prerequisites: Ed 261, 262 or 261, 265 or Ed 261, 282 or 261 and consent of the instructor. Fall, Winter, Spring, Summer.

371. Community Education Laboratories. 5 Hours. Three hours class time; ten to fourteen hours per week in directed field work. Analysis of the nature of the educational enterprise and of the relationships among the educational controllers, the teacher, and the community, through reading, lecture, discussion, and field work. Techniques for altering professional accountability of teachers from the employing community to the students and community they purport to help. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

372. Special Education Practicum. 8 to 16 Hours. Practice teaching in the field of special education to meet certification requirements; focus on teaching the emotionally disturbed, mentally retarded, or learning disabled. A weekly seminar is included. Prerequisite: Completion of the graduate sequence in an area of special education. Student teaching applications are due two terms in advance. Fall, Winter, Spring.

373. Studies in Native American Education. 4 Hours. May be repeated for a maximum of 12 hours. Same as Native American Studies 373. Educational policy, learning styles, language, and practice. Specific topics are announced each term. Prerequisite: Ed 200.

383. Teaching English as a Second Language. 4 Hours. Same as English 383 and Linguistics 383. The methodology of teaching English to residents of the United States who do not speak the language, especially Spanish-Americans. Prerequisite: Engl 300 or 205 or Ling 305.

387. Career and Educational Counseling in the Community College. 4 Hours. Same as Psychology 387. Introduction to sources of information on careers and educational programs; basic techniques of student personnel contact appropriate to community college students; principles of career choice and guidance for students anticipating direct job entry or transfer to other institutions. Prerequisites: Psch 240 or Ed 250; Ed 321 or Psch 283 or 386 or the equivalents; and consent of the instructor.

390. Critique of Educational Literature, Research Design, and Methodology. 4 Hours. Introduction to educational research literature; analysis of research findings in urban education; research methods and design in education; current issues in research methodology. Students formulate a researchable problem and design a systematic study in their area of concentration. Prerequisite: One evaluation course or graduate standing and consent of the instructor. Fall, Winter, Spring, Summer.

Courses for Graduate Students

400. Seminar on Educational Sociology. 4 Hours. Sociological survey of the urban educational institution in the contexts of its neighborhood and of the larger social order. The school is considered a community with its own social structure and culture interacting with a neighborhood with a different social structure and culture. The interface between school and neighborhood is studied in detail. Fall.

401. School Finance and Policy Analysis. 4 Hours. Same as Urban Planning and Policy 492. Concepts of school finance, taxation, and resource allocation. Role of state, local, and federal government in the support of education. Fundamentals of program budgeting and systems analysis techniques in educational planning. Prerequisite: Consent of the instructor. Winter.

402. Improving Educational Organizations: Planning and Decision-Making. 4 Hours. Same as Urban Planning and Policy 493. The decision-making process within educational organizations. Different theories of decision-making are analyzed and applied to the formulation of school policy. Prerequisite: Consent of the instructor. Spring.

404. Teaching School Subjects to the Deaf. 4 Hours. The development of curriculum and instructional objectives to provide equivalent and compensatory educational opportunities for the deaf student. Prerequisites: Ed 354, 356. Spring.

405. Psychoeducational Aspects of Deafness. 4 Hours. The effects of sensory deprivation and impact of deafness on cognitive development, social and emotional behavior, and verbal learning as they relate to the education of the hearing-impaired. Prerequisite: Credit or concurrent registration in Ed 404. Spring.

418. Research and Evaluation in Special Education. 4 Hours. Research and evaluation strategies and statistical methods for the assessment of applied and theoretical models in special education. Prerequisites: Acceptance in the Master of Education program and Ed 310. Fall, Winter, Spring, Summer.

420. Early Childhood Program Development I. 6 Hours. Laboratory-discussion course; utilizes the student's teaching situation as the practicum site for practice in program development. Discussion topics include goals and objectives, materials and equipment, and establishing and maintaining a learning environment. Prerequisites: Ed 322, 329, and consent of the instructor. Fall.

421. Early Childhood Program Development II. 6 Hours. Laborato-

ry-discussion course; utilizes the student's teaching situation as the practicum site for practice in program development. Discussion topics include implementation of curriculum objectives and evaluation of the individual child. Prerequisite: Ed 420. Winter.

422. Early Childhood Program Development III. 4 Hours. Laboratory-discussion course; utilizes the student's teaching situation as the practicum site for practice in program development. Discussion topics include implementation of curriculum objectives, evaluation of the individual child, the family, and the community, working with classroom assistants and volunteers, and articulation with public school programs. Prerequisite: Ed 421. Spring.

423. Seminar on Education and Social Development. 4 Hours. Implications for educational planning and practice stemming from theory and research on the development of social concepts, i.e., gender identity, affectivity, morality. Prerequisite: Ed 321 or 322 or 345 or consent of the instructor. Spring.

426. Biological, Cognitive, and Social Development in Infancy and Early Childhood. 4 Hours. Intensive consideration of developmental processes, capacities, and readiness from birth to the age of 6 years. Stress is on theories, research, individual child study, and educational implications. Prerequisite: Ed 322. Fall.

429. Advanced Piaget's Theory: Application to Early Education. 4 Hours. Piaget's theory of the development of knowledge, particularly in areas related to early childhood education, e.g., space, time, causality, and representation. Emphasis on educational implications. Prerequisite: Ed 329. Winter.

430. Curriculum, Instruction, and Evaluation in Urban Education II. 4 Hours. Decision-making in developing curricula, in selecting instructional materials, and in evaluating the effectiveness of the curriculum, instruction, and materials. Prerequisite: Ed 330 or consent of the instructor. Fall, Summer.

431. Curriculum Theory and Technology. 4 Hours. Components of the curriculum system are analyzed through the study of curriculum theory. The technology of curriculum planning and of implementing and evaluating local, state, and national curricula. Prerequisites: Ed 330 or 331; Ed 390. Summer.

432. Resources and Methods for Instructional Improvement. 4 Hours. Offered in collaboration with staff from several school systems to develop an understanding of available resources and methods for initiating innovative plans for in-service instruction and program development. Prerequisites: Ed 330, 331; or Ed 330 or 331 and one 400-level reading course. Fall.

433. Organization Development in Schools. 4 Hours. A laboratory-discussion course designed to teach concepts and develop skills for leading school improvement efforts. Activities simulate school situations and focus on the practice of leadership behaviors that develop organizational support for program improvement. Prerequisite: Ed 331 or 432 or consent of the instructor. Summer.

438. Internship in Special Education. 4 to 12 Hours. In-depth study in the child study program or the child study research laboratory or practicums in various specializations, such as the teaching of learning-disabled, emotionally disturbed, mentally retarded, or hearing-impaired children. Prerequisites: Completion of the first three introductory courses at the MEd level in special education and consent of the instructor one full term previous to registration. Applications are due two terms in advance. Fall, Winter, Spring, Summer.

439. Internship in Instructional Leadership. 2 to 6 Hours. May be repeated for a maximum of 8 hours. The internship is conducted on an educational situation under the supervision of a principal or agency staff and a member of the University faculty. The intern develops, implements, and reports on an instructional improvement program. Prerequisites: Ed 432 and consent of the coordinator of the area of specialization. Winter, Spring.

440. Guidance in the Urban School: Principles and Functions. 4 Hours. The guidance process concerned with providing for the developmental needs of all pupils. The interrelated roles of teacher, counselor, and other staff members in fostering a climate in which healthy personalities can develop; emphasis on the full use of school and community resources. Prerequisite: Ed 321 or 322. Winter, Summer.

441. Student Appraisal Procedures in the Urban School. 4 Hours. Some of the ways in which the teacher and counselor can assess child behavior and development. Nontesting methods and interpretation of selected achievement, aptitude, and interest tests at different educational levels. Emphasis on the understanding of cultural factors

that may limit effective appraisal. Prerequisite: Ed 440. Fall.

442. The Counseling Process. 4 Hours. The nature, functions, and goals of counseling in an urban school or youth center. Selected theories, with applications for school and agency counseling, and related problems and issues. An introduction to counseling interaction is provided through role-playing and supervised interviews in which study skills and related educational problems are presented. Prerequisites: Ed 344, 440. Spring.

443. Career Guidance and Planning. 4 Hours. Counseling theory and assessment methods to assist clients in career decision-making and planning. Required weekly practicum. Prerequisite: Ed 440. Winter.

444. Group Methods in Counseling and Guidance. 4 Hours. Selected problems in group work with clients at various developmental levels and in a variety of settings in schools, public and private agencies, industry, and communities. Assessment of problems and outcomes amenable to group treatment. Supervised participation in simulations and practice in several models of group work. Prerequisite: Ed 442.

445. Educational Evaluation Design and Methods I. 4 Hours. A basic course; theoretical and operational assumptions of different approaches to evaluation. Students work with a range of practical problems in the use of evaluations in various educational settings and assess the advantages and constraints of evaluation data. Prerequisite: Ed 390. Winter, Summer.

446. Educational Measurement. 4 Hours. Design, analysis, and critique of cognitive, affective, and behavioral instruments and techniques for use in educational settings. Each student makes a critical analysis of a published test, constructs a pilot instrument, and performs an item analysis. Spring.

447. Analysis of Multivariate Educational Data. 4 Hours. Introductory multivariate analysis; research designs, criticism of applications, and the solution of real and simulated practical problems. Skills are acquired in the use of batch-process computers and desk calculators. Prerequisites: Ed 390, QM 369. Summer.

448. Internship in Measurement and Evaluation. 4 Hours. Internship in the Office of Evaluation and Research of the College of Education. Area majors in measurement and evaluation become involved with evaluation projects in schools and governmental and social service agencies under the supervision of a project director. May be taken in one or two terms. Prerequisites: Ed 445, 447. Fall, Winter, Spring, Summer.

450. Foundations of School Administration. 4 Hours. Introductory course in urban school administration. Emphasis on control and operation of American schools from social, legal, political, and financial perspectives. Prerequisite: Consent of the instructor. Winter, Summer.

451. Administration Problems in Urban Schools. 4 Hours. The school as a social and political institution and its role in the solution of contemporary social problems. Prerequisite: Ed 450. Spring.

452. The School Principalship. 4 Hours. Administrative and policy-making functions of principals with special reference to metropolitan communities. Emphasis on research findings, case studies, and simulations to examine such areas as instructional services, staff relations, and school-community interaction. Prerequisite: Ed 450. Fall.

453. Activist Approaches to Urban Guidance. 4 Hours. Theory and practical application of active, participating approaches to urban school guidance services. Some of the models are student advocacy, ombudsmanship, the *educateur*, and environmental intervention. Prerequisite: Ed 440. Winter.

454. Practicum in Counseling and Personnel Services. 8 to 16 Hours. Supervised practice in schools and other institutional settings. Prerequisites: Ed 441, 442. Spring.

459. Internship in School Administration. 8 Hours. For students enrolled in the master's program in school administration. Students are placed in schools and community agencies to obtain practical knowledge of some of the community-school relationships studied in Education 450 and 451. Prerequisite: Ed 451. Fall, Winter, Spring.

460. Administration of Handicapped Youths Programs. 4 Hours. Alternate administrative and instructional arrangements for programming handicapped students in regular classrooms and schools. Analysis of current legislation, funding, in-service training, and needs and rights of children and parents. Prerequisite: Ed 452. Spring.

- 463. Analysis of Research Literature in Reading. 4 Hours.** Critical analysis of issues in reading and reading instruction with reference to research. A research project is developed. Prerequisite: An introductory statistics course or Ed 390, Ed 360 or the equivalent, and consent of the instructor. Fall, Summer.
- 464. Language Foundations of Reading Behavior. 4 Hours.** Analysis of language-based models of reading behavior; language development and reading; stylistic complexity of written prose. Stress on reading development of both monolingual and bilingual pupils. Prerequisites: At least one undergraduate or graduate course in linguistics, at least two undergraduate or graduate reading courses, and consent of the instructor. Fall, Spring.
- 465. Diagnostic and Remedial Reading Instruction I. 3 Hours.** Theoretical and practical issues concerning the etiology of reading problems and clinical diagnostic techniques. Two reading-disabled children are diagnosed in the practicum component. Prerequisites: Ed 360, 390. Winter, Summer.
- 466. Diagnostic and Remedial Reading Instruction II. 3 Hours.** Issues in remedial reading instruction. Two reading-disabled children receive individual tutoring in the practicum component. Prerequisite: Ed 465. Fall, Spring.
- 467. Guiding the School Reading Program: Supervision and Inservice Instruction. 4 Hours.** Theoretical and practical aspects that influence the role of the reading specialist-supervisor. Management and evaluation of support systems. Reading program models. Supervision and guidance of reading personnel. Models for planning and presenting inservice education programs in reading. Prerequisites: Ed 330 or 331, and Ed 360 or equivalent and consent of instructor. Spring.
- 468. Education and the Law. 4 Hours.** Legal rights, privileges, responsibilities, immunities, and authority of pupils, parents, teachers, administrators, school boards, and government units in relation to the school; major court decisions affecting education policy. Prerequisite: Ed 450. Fall.
- 469. Internship in Reading Leadership. 2 to 6 Hours.** May be repeated for a maximum of 8 hours. Conducted in a selected school under the supervision of a University faculty member. Students plan and lead reading program development in conjunction with school administration, staff, and parents. A final paper reporting on the development, implementation, and evaluation of the program is required. Prerequisites: 40 hours in the Master of Education program and consent of the adviser in the area of concentration. Winter, Spring.
- 470. Education Policy: Historical and Philosophical Analysis. 4 Hours.** The evolution of American educational thought and policy against the background of significant social and intellectual developments in American culture. Special attention to historical and social philosophical analysis of recurring education policy issues. Prerequisite: Consent of the instructor. Winter, Summer.
- 471. Education Policy Formation. 4 Hours.** The institutional and social forces that influence education policy-making. Emphasis on governmental roles, including legislative processes and court decisions. Prerequisite: Consent of the instructor. Fall.
- 472. Education Policy Outcomes. 4 Hours.** Analysis of variables shaping the outcomes of education policy objectives and expectations. Case studies of community and institutional responses to selected state and federal educational policies. Prerequisite: Consent of the instructor. Spring.
- 473. The Economics of Education and Income Distribution. 4 Hours.** Same as Economics 451. Basic concepts and tools of economics applied to individual and public decision-making in the area of education. Analysis of monetary and nonmonetary returns to schooling. Discussion of costs of education, and educational production functions. Impact of education on income distribution and growth. Prerequisite: Consent of the instructor. Winter.
- 474. Curriculum and Program Design. 4 Hours.** Analysis of the constructs inherent in a generic curriculum and instruction design. The range of possible variations within the constraints imposed by the design. The basic paradigms found in extant curricula and social programs. Prerequisite: Consent of the instructor. Fall.
- 475. Educational Evaluation Design and Methods II. 4 Hours.** Theory and models of evaluation; analysis and critique by students of a series of case studies of evaluations; development of alternative designs for evaluation of social and educational programs. Prerequisite: Ed 445. Spring.
- 476. Proseminar on Educational Policy Research. 6 Hours.** Analytic approaches to selected problems in educational policy and evaluation; emphasis on their implications for policy planning. Review of research literature and formulation of a research problem. Prerequisites: 28 hours in the education policy specialization and consent of the instructor. Spring.
- 477. Analysis of Instructional Materials. 4 Hours.** Textbooks, printed materials, instructional modules, and films and filmstrips are analyzed for their instructional design characteristics. Strengths and weaknesses of different variables are identified and methods for provisioning instructional design constructs are developed. Prerequisites: Ed 430, 431. Summer.
- 478. Theoretical Frameworks of Educational Politics. 4 Hours.** Basic concepts, hypotheses, research findings, and theory development. Nature and function of theory in educational politics at the federal, state, and local levels. Prerequisite: Ed. 306 or consent of the instructor. Spring.
- 479. Organization and Management in Education I. 4 Hours.** Theoretical and methodological perspectives on the management of educational organizations. Models of decision-making, organizational effectiveness, and organizational development in education. Topical problems in current educational management practice. Prerequisite: Ed 450 or consent of the instructor. Fall.
- 480. Organization and Management in Education II. 4 Hours.** Management techniques and procedures in education. Fiscal, logistical, allocative, informational, and planning systems in educational organizations. Comparative management problems in public, nonpublic, and higher education. Prerequisite: Ed 479 or consent of the instructor. Winter.
- 481. Collective Bargaining Policy in Education. 4 Hours.** Analysis of collective bargaining case studies and agreements with emphasis on implications for education policy formulation. Winter, Summer.
- 482. Cultural Pluralism and Education Policy. 4 Hours.** Social philosophical analysis of the theory of cultural pluralism emphasizing its relation to the liberal-experimentalist tradition in educational thought; selected equal educational opportunity policies; recent federal and state legislation on multicultural education. Fall.
- 484. Administration and Student Discipline. 4 Hours.** School administration to improve student discipline, increase student prosocial conduct, strengthen student commitment, and stimulate inschool community. Theoretical and programmatic issues. Prerequisite: Consent of the instructor. Spring.
- 490. Ethnography of Urban Educational Institutions. 4 Hours.** Ethnography of an urban educational institution and its interaction with clientele. Ethnographic and microethnographic techniques, including the use of tape recorder and film, are surveyed and practiced in a field study. Readings in cognitive anthropology, organization research, and urban ethnography accompany the field work. Prerequisites: Ed 400 or the equivalent and consent of the instructor. Spring.
- 491. Problems in Urban Education. 4 Hours.** May be repeated up to a total of 8 hours. Same as Urban Planning and Policy 491. Intensive field-oriented study of selected urban educational problems, such as bureaucracy and education, ethnic concern and schools, and educational finance. Emphasis on the collection and analysis of appropriate data. Fall, Spring.
- 495. Seminar on Theory and Research in Special Education. 4 Hours.** Systematic, in-depth review of selected topics. May be repeated by students in various areas of specialization. Prerequisites: Ed 418 and consent of the instructor. Fall, Spring.
- 496. Independent Study in Educational Administration. 1 to 8 Hours.** Self-directed, independent study under supervision to develop the individual's ability as an independent student to allow study in areas in which appropriate courses are not offered during particular terms. Prerequisite: Approval of the study outline by the adviser and the department chairperson. Fall, Winter, Spring, Summer.
- 497. Individual Study. 1 to 6 Hours.** Students design, implement, and analyze results of a researchable problem in their individual area of concentration. Completed study is reviewed by faculty and peer committees. Prerequisites: Ed 390 or the equivalent and consent of the instructor. Fall, Winter, Spring.
- 498. Independent Study in Human Development and Learning. 1 to 8 Hours.** Presentation of a written proposal to the faculty detailing the specifics of the proposed project or course of reading and basis for evaluation is required. Prerequisite: Consent of the instructor.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Research on the topic of the student's dissertation. Prerequisites: Consent of the instructor and approval of the research prospectus by the dissertation committee.

ENERGY ENGINEERING

Paul M. Chung, Head of the Department
Joseph C.F. Chow, Director of Graduate Studies

Professors: Huei-Huang Chiu, Joseph C.F. Chow, Paul M. Chung, James P. Hartnett, John H. Kiefer, Irving F. Miller, Satish C. Saxena, Harold A. Simon

Associate Professors: Allen C. Cogley, David S. Hacker, G. Ali Mansoori, Wolodymyr J. Minkowycz, Edward S. Pierson (Adjunct), Stephen Szepe

Assistant Professors: Ejup N. Ganic, James J. Komar

The department offers a program leading to the Master of Science in Energy Engineering and, jointly with the Departments of Information Engineering and Materials Engineering, a program leading to the Doctor of Philosophy in Engineering. These programs are broadly based to accommodate students in aerospace, chemical, mechanical, and power engineering and in related fields. The primary areas upon which these fields are based are continuum and molecular fluid mechanics, heat and mass transfer, macroscopic and microscopic thermodynamics, chemical kinetics, and process analysis.

The department also cooperates with the Department of Geological Sciences in offering a coordinated program of study for students interested in the field of geotechnical engineering and geosciences. This program, leading to the Doctor of Philosophy in Engineering, enables the student with interests in soil engineering, rock mechanics, engineering geology, hydrology, environmental geology, geophysics, and other areas of geosciences to pursue advanced work.

After students are admitted to the Graduate College, they are assigned a temporary adviser; they are required to choose a permanent adviser during the first year. As soon as the permanent adviser has been selected, the student must outline the complete program proposed for the degree (MS or PhD) in consultation with the adviser and the graduate committee of the department.

The PhD program includes the following broad areas of specialization: continuum mechanics, environmental engineering, fluid mechanics, gas dynamics, geotechnical engineering, heat transfer, metallurgy, plasma dynamics, soil engineering, chemical engineering, and structures. Of these, the Department of Energy Engineering offers study in the fields of chemical engineering, environmental engineering, fluid mechanics, gas dynamics, and heat transfer. Students are permitted and encouraged to follow interdisciplinary programs that may include more than one area of specialization and may require enrollment in courses in more than one department.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and must submit three letters of

recommendation. In exceptional cases, students who have averages of less than 4.00 but above 3.75 may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Applicants who have majored in fields other than engineering must remedy deficiencies in their preparation before being granted full standing in the graduate program. Applicants for degree or nondegree admission must submit complete transcripts from all colleges and universities attended.

Degree Requirements

A grade point average of at least 4.00 is required. Credit toward a graduate degree is not given for any course in which a grade of less than C has been obtained.

Master of Science

For a degree, 48 quarter hours are required, at least 16 of which must be in 400-level courses. Students may or may not submit a thesis; if they do so, 16 hours of Energy Engineering 499—Thesis Research, in addition to the 16 hours in 400-level course work, will be credited toward the degree. If they do not present a thesis, they must complete a project under the guidance of a department adviser. This project requires a report that demonstrates to the adviser's satisfaction the ability of the student to conduct professional work at the master's level. Upon completion of this project, 4 hours of credit is awarded. If a thesis is submitted, the candidate is exempt from the project, but at the completion of the thesis it must be defended before an examining committee.

In the field of chemical engineering, students are required to take Energy Engineering 402, 431, and 438.

Doctor of Philosophy

All students who plan to study for the PhD are required to pass one out of a maximum of two written preliminary examinations, offered twice each year. This requirement must be satisfied within the first year if the student enters with a master's degree and within one year after the completion of 48 credit hours of graduate study if the student enters with a bachelor's degree. For students who are admitted on limited standing with specified deficiencies to be removed, the above time limits will be extended as deemed appropriate in each case by the graduate committee of the department.

For the PhD, a minimum of 96 hours of course work beyond the bachelor's degree is required, of which at least 32 hours must consist of 400-level courses. The total must include a major, the scope of which is to be determined by the adviser and the graduate committee of the department, and a minor of at least 24 quarter hours. Credit in two courses from the Department of Materials Engineering and at least 12 quarter hours in courses offered by the Department of Mathematics, of which at least three hours must be at the 400 level, are required.

A major requirement of the PhD program is the completion of a thesis based on original research carried out under the supervision of the student's adviser. The thesis, also written under the supervision of the adviser, must be defended before an examining committee.

Courses for Graduate and Advanced Undergraduate Students

304. Transport Phenomena. 4 Hours. Introduction to continuum theory of momentum, energy, and mass transfer. Transport of scalar and vector quantities. Reynolds's transport theorem. General differential equations of transport phenomena. Momentum shell balances. Energy transport. Diffusion. Couple operations: free



convection, simultaneous heat and mass transfer. Prerequisites: EnrE 201, 211.

305. Statistical Thermodynamics. 4 Hours. Microscopic statistical approach to thermodynamic systems. Calculation of partition function and thermodynamic properties. Polyatomic systems; chemical equilibrium; other engineering applications. Prerequisites: EnrE 201; Math 220 or the equivalent.

307. Kinetic Theory of Gases and Transport Phenomena. 4 Hours. Basic concepts of kinetic theory of gases. Equations of state and their molecular interpretation. Elementary classical statistics, molecular collisions. Application of the kinetic theory to viscosity, heat conduction, and diffusion. Prerequisite: Completion of the core program.

311. Ocean and Estuary Hydrodynamics. 4 Hours. Fluid mechanics of oceans, estuaries, coastlines, and lakes. Tidal, current, and wave phenomena of large, free-surface bodies of water in rotating coordinates. Laboratory work with rotating water table and wave generation and measurements. Prerequisite: EnrE 214.

313. Flight Dynamics: Stability and Control. 4 Hours. Static and dynamic stability and control of six-degree-of-freedom machines with aerodynamic and propulsive loading. Development of the complete force, moment, orientation, and control equations. Laboratory in aerodynamic force measurements and analog simulation of stability and control. Prerequisite: EnrE 212.

314. Propulsion. 4 Hours. Thermodynamics and fluid mechanics of air breathing engines. Performance of rockets—chemical, nuclear, and electrical. Prerequisite: EnrE 213.

316. Introduction to Continuum Mechanics. 4 Hours. Same as Materials Engineering 316. Cartesian tensors, kinematics of fluids and solids, conservation equations, constitutive equations for simple materials. Examples. Prerequisites: EnrE 211 or MatE 204, Math 220.

317. Intermediate Fluid Mechanics. 4 Hours. Development of the conservation equations for a Newtonian fluid: continuity, Navier-Stokes, and energy equations. Some exact and approximate solutions of highly viscous, viscous, and inviscid flow problems. Prerequisite: Math 220 or the equivalent.

318. Elements of Turbulent Flow and Mixing. 4 Hours. Turbulent transport equations; statistical nature of turbulent transports; recent developments in turbulent mixing; free shear flows; stratified flows; wall shear flows. Prerequisites: EnrE 214 and any one of EnrE 221, 234, 311, 361.

319. Acoustical Fluid Mechanics. 4 Hours. Physical description of acoustical sources, propagation, and receivers. Fluid turbulence, oscillations, and instabilities as sources of noise. Applied acoustics for the design of sound control devices and materials. Laboratory in the calibration and use of acoustical instrumentation. Fluid sound sources. Prerequisite: EnrE 213.

320. Heating, Ventilating, and Air Conditioning. 4 Hours. Refrigeration systems and heat-pump, ventilation systems, residential and industrial requirements, heating and cooling loads, air-washers, system controls. Prerequisites: EnrE 201 and 211 or OM 412 (School of Public Health) or Arch 316.

321. Intermediate Heat Transfer. 4 Hours. Topics in conduction, convection, and radiation with emphasis on exact solutions; extended surfaces, two-phase flow, entrance length problems, real surface and gaseous radiation problems, and combined modes of heat transfer. Laboratory to complement the lectures. Prerequisite: EnrE 221.

325. Combustion Engineering. 4 Hours. Topics in combustion, providing both theoretical and applied understanding of flame processes as they relate to furnace design, air pollution, and propulsion. Heat and mass transfer by various modes, chemistry and dynamics of combustion phenomena. The course relates to material found in current literature. Prerequisites: EnrE 201 and either 214 or 234.

331. Chemical Engineering Thermodynamics. 4 Hours. Review of classical engineering thermodynamics. The property relations and mathematics of properties. Thermodynamics of energy conversion of fluid flow. Multicomponent systems and multicomponent phase equilibria. Equilibrium in chemically reacting systems, heterogeneous equilibrium, Gibbs phase rule, and electrochemical processes. Prerequisite: EnrE 201 or the equivalent.

335. Physical Properties of Fluids. 4 Hours. Prediction and correlation of the various equilibrium and nonequilibrium properties of pure fluids and their mixtures, such as critical constants, vapor pressure, latent heat of vaporization, heat capacity, heat of formation, surface tension, virial coefficients, viscosity, thermal conductivity, and diffusion coefficients. Prerequisites: EnrE 201, 211.

337. Fluidization Engineering. 4 Hours. Fluidization phenomenon. Applications of fluidized beds and their gross properties. Bubbling bed model, gas and solids flow in the fluidized beds. Gas-solid reaction kinetics and combustion of a single pellet. Entrainment and elutriation theories. Heat and mass transfer in fluidized beds. Analytical modeling of fluid and slugging beds. Prerequisite: EnrE 386 or consent of the instructor.

338. Particulate Solids Processing. 4 Hours. Same as Materials Engineering 338. Mathematical characterization of distribution of particle size; the population balance. Mechanical methods of size classification and size reduction. Energy consideration in the theory of grinding. Fluid-solid and solid-solid separation processes; fluidization of mixed solids, transport of suspensions of solids. Prerequisites: EnrE 211, MatE 230.

345. Introduction to Chemical Process and Energy Conversion Control. 3 Hours. Analysis and formulation of chemical and energy conversion operations requiring control. Design and analysis of feedback and feedforward systems used to control chemical and energy

conversion equipment. Stability, tuning, and simulation of control systems using analytical techniques and digital computers. Prerequisites: EnrE 287, Math 220.

351. Electromechanical Energy Conversion I. 4 Hours. Conservation of energy and electromagnetic forces. Principles of rotating machines and equations of motion. Applications to synchronous, induction, dc, and novel machines. Linear and nonlinear lumped-parameter systems, stability. Laboratories. Prerequisites: InfE 212, 219.

352. Electromechanical Energy Conversion II. 4 Hours. Continues Energy Engineering 351. Completion of rotating machines and lumped-parameter systems. Interaction of electromagnetic fields with stationary and moving continuous media, Maxwell stress tensor, waves and instabilities. Applications to energy conversion with emphasis on fluids (magnetohydrodynamics). Laboratories. Prerequisites: EnrE 211, 351, InfE 221.

353. Direct Energy Conversion. 4 Hours. Novel methods of converting heat directly to electrical energy. Topics are chosen from among, but not limited to, magnetohydrodynamics, thermoelectrics, thermionics, and fuel cells. Prerequisites: EnrE 211 and 251 or 351.

361. Atmospheric Motions. 4 Hours. The equations of motion on a rotating earth and their application to meteorology. Various aspects of inertial, geostrophic, and gradient winds. Atmospheric turbulence and flow in the earth's boundary layer. Laboratory modeling criteria and dynamic similitude. Diffusion of heat, water vapor, and atmospheric pollutants. Prerequisite: EnrE 214.

371. Air Resource Engineering. 4 Hours. Advanced study of the air resource system; emphasis on quantitative relationships among sources, meteorology, and receptors. Topics include air sampling and analysis techniques, application of atmospheric diffusion equations to source monitoring and prediction of ambient air quality, and theory and design of control equipment for particulate and gaseous pollutants. Prerequisites: EnrE 232 or the equivalent and EnrE 261 or EH 300 (School of Public Health).

372. Water Resources and Pollution Control. 4 Hours. Hydraulics of water supply and distribution systems. Water quality tests for biological and chemical pollutants. Basic principles and theory of water purification and sanitary engineering, including physical, chemical, and biological treatment processes. Advanced water reclamation techniques. Prerequisites: Chem 121, EnrE 261.

375. Aerosols Engineering. 4 Hours. Classification, distribution, convection, diffusion, and dispersion of aerosols in laminar and turbulent flows. Coagulation, photophoresis, thermophoresis, and diffusiohphoresis. Application of the theory to pollution control technology. Prerequisite: EnrE 214 or 234.

386. Chemical Reaction Engineering. 4 Hours. Kinetics of homogeneous single reactions. Ideal reactors: batch, stirred tank, and plug flow systems. Conversion and yield in multiple reactions. Design and optimization of reactors. Nonisothermal reactors. Prerequisite: Chem 342 or the equivalent.

388. Catalytic Reaction Engineering. 4 Hours. Adsorption and chemisorption, heterogeneous catalytic kinetics, diffusion and heterogeneous catalysis. Various catalytic reactors (fixed-bed, fluidized-bed, laboratory, monolith, trickle-bed). Catalyst deactivation. Reactor design for deactivating catalyst. Prerequisite: EnrE 386 or consent of the instructor.

391. Seminar. 1 to 4 Hours. May be repeated for credit. Topics of mutual interest to a faculty member and a group of students are announced by department bulletin or the Timetable. Prerequisite: Consent of the instructor.

396. Senior Design I. 4 Hours. Introduction to engineering economics, legal and social constraints on design, safety and reliability theory, and the use of simulation and optimization techniques in the engineering design process. Prerequisites: Senior standing and completion of all core requirements in the College of Engineering.

397. Senior Design II. 4 Hours. Application of principles of engineering and engineering design methodology to the solution of a large-scale problem. Prerequisite: EnrE 396.

Courses for Graduate Students

401. Advanced Thermodynamics. 4 Hours. The laws of thermodynamics. General conditions for equilibrium and stability. Thermo-

dynamics potentials. Phase transition and critical phenomena. Systems in electric, magnetic, gravitational, and centrifugal fields. Principles of irreversible thermodynamics. Onsager's fundamental theorem. Engineering applications. Prerequisites: EnrE 202, Math 220 or the equivalents.

402. Fluid- Phase Equilibria. 4 Hours. Application of the laws of thermodynamics to fluid-phase equilibria systems. Concepts of chemical potential, fugacity, and activity. Application of phase rule to multicomponent fluids. Latent heat and vapor pressures, consistency test. Engineering applications. Prerequisite: EnrE 331.

403. Thermodynamics of Multicomponent Systems. 4 Hours. Application of thermodynamics to chemical engineering systems. Laws of corresponding states and conformal solution theories. Dilute, ideal, near-ideal, and nonideal solutions. Molecular considerations and their use for prediction and correlation of data. Prerequisite: EnrE 402 or the equivalent.

405. Advanced Statistical Thermodynamics. 4 Hours. Electromagnetic radiation, quantum mechanics of solids, diatomic and polyatomic gases, statistical mechanics of interacting particles, real gases and liquids, chemical equilibrium and irreversible processes; emphasis on the engineering applications. Prerequisite: EnrE 305.

407. Kinetic Theory of Nonuniform Gases. 4 Hours. Distribution function: Boltzmann equation and its solution, two-particle collisions, inverse collisions, collision cross-sections, intermolecular forces, derivation of transport coefficients of gases, and thermal diffusion. Prerequisites: EnrE 307, Math 322.

414. Mechanics of Viscous Fluids. 4 Hours. Internal and external flows. Boundary layer analysis. Similarity solutions, integral methods, and other techniques for treating laminar and turbulent flows. Prerequisite: EnrE 317 or the equivalent.

416. Compressible Fluid Mechanics. 4 Hours. Conservation equations, equations of state, surface of discontinuity, one-dimensional and two-dimensional subsonic and supersonic flows, Prandtl-Mayer expansions and shock phenomena, theory of characteristics, and hodograph methods. Prerequisite: EnrE 213 or the equivalent.

418. Fundamentals of Turbulence. 4 Hours. Mathematical descriptions of turbulence field; kinematics of homogeneous turbulence; correlation and spectrum tensors; dynamic behavior of isotropic turbulence; universal equilibrium theory; nonisotropic turbulence; transport processes in turbulent flows. Prerequisites: EnrE 414 or 422 and Math 323 or the equivalent.

419. Nonlinear Continuum Mechanics I. 4 Hours. Same as Materials Engineering 419. Kinematics and fundamental laws of mechanics. General constitutive equations; reduced constitutive equations. Homogeneous motions of simple bodies. Isotropic group, simple fluids, simple solids, simple subfluids. Examples. Prerequisite: EnrE 316.

420. Nonlinear Continuum Mechanics II. 4 Hours. Same as Materials Engineering 420. Special classes of materials. Simple fluids, viscometric flows, the Weissenberg effect. Isotropic elastic materials, exact solutions. Wave propagation. Thermodynamics. Nonlinear viscoelastic materials, polar materials, and other materials. Prerequisite: EnrE 419.

421. Heat Conduction. 4 Hours. Analysis of heat conduction in solids, including the use of Fourier series, integral transforms, similarity transformations, and approximate methods. Prerequisite: Consent of the instructor.

422. Convective Heat Transfer. 4 Hours. Conservation equations. Momentum, heat, and mass transfer in laminar and turbulent boundary layers for internal and external flows. Convective heat transfer at high velocities. Heat transfer with change of phase. Special topics in convective heat transfer. Prerequisite: EnrE 317 or the equivalent.

424. Thermal Radiation. 4 Hours. Introduction to Planck's quantum theory. Black-body radiation; Wien's law; Stephan-Boltzmann's law. Basic concepts of total and spectral emissivity, absorptivity, reflectivity, and transmissivity. Kirchhoff's law. Radiation exchange between solid surfaces; gaseous radiation; radiation-convection interaction. Prerequisite: Consent of the instructor.

426. Radiation Gas Dynamics. 4 Hours. Basic laws and definitions of thermal radiation. Energy transfer in absorbing, emitting, and scattering media. Thin and thick approximate methods. Radiative equilibrium. Combined conduction and radiation. Combined convection and radiation. Prerequisites: EnrE 414 or 422 and Math 321 or the equivalent.

431. Advanced Chemical Reaction Engineering. 4 Hours. Nonideal reactors; the effects of residence time distribution and mixedness. Heterogeneous noncatalytic reactions; gas-liquid, liquid-liquid, and solid-fluid systems. Heterogeneous catalytic reactions. Time dependent systems; catalyst deactivation. Prerequisite: EnrE 386.

433. Turbulent Shear Flows. 4 Hours. Homogeneous and inhomogeneous shear fields; energy spectra; classical theories and mixing length; stochastics of Navier-Stokes equation; turbulent combustion; atmospheric dispersion of pollutants; recent developments. Prerequisite: EnrE 418.

435. Advanced Process Analysis. 4 Hours. Analysis and formulation of naturally occurring and industrial processes. Classification of the processes and the division of each process into subsystems. Determination of the relations among the subsystems and the mathematical modeling of these relationships. Evaluation of how well the models will represent the real processes. Engineering applications and interpretation of the results. Prerequisite: EnrE 304 or 406.

436. Chemically Reacting Flows. 4 Hours. Nonequilibrium states; chemical thermodynamics and kinetics. Multicomponent continuum equations for flow of nonequilibrium fluids. Inviscid nonequilibrium flows. Boundary layer flows with surface and gas-phase reactions. Frozen and equilibrium criteria. Waves in relaxing media. Prerequisites: EnrE 414 or 422, and 416.

437. Process Dynamics. 4 Hours. Analysis of unsteady state phenomena. Emphasis on physical interpretation of dynamic responses and analytical techniques. Linear and nonlinear responses in lumped parameter and distributed parameter systems. Deliberate unsteady state operations. Applications to flow, heat and mass transfer, and chemical reactor systems.

438. Separation Processes. 4 Hours. Advanced treatment of separation processes based on preferential migration. General theory. Binary and multicomponent distillation. Absorption, adsorption, and extraction processes. Gas chromatography and liquid chromatography. Dialysis and miscellaneous other separations. Prerequisite: EnrE 304.

439. Mass Transfer in Liquid Systems. 4 Hours. Treatment of modern diffusion theories as applied to liquid-liquid and liquid-solid systems. Advanced treatment of molecular and macroscopic diffusional phenomena in multiphase, multicomponent systems, including theory of liquid state, ideal and nonideal solutions, coupled mechanisms in diffusion transfer, and engineering design of liquid contacting equipment. Prerequisite: EnrE 305.

440. Non-Newtonian Fluids. 4 Hours. Constitutive equation for non-Newtonian fluids. Simple fluids. Viscoelasticity. Viscometric flows. Helical flow. Large elastic deformations, stress relaxation. Thermodynamics of viscoelastic fluids. Time-temperature superposition. Transport phenomena in non-Newtonian fluids. Experimental methods and results. Prerequisite: EnrE 316.

451. Kinetics of Gas Reactions. 4 Hours. Basic concepts of reaction rate and mechanism. Collision theory, absolute rate theory, and theory of unimolecular decomposition. Dissociation, recombination, and chain reactions. Combustion, flames, and detonations. Catalysis. Prerequisites: EnrE 304, 305.

460. Biotransport I: Diffusional Processes. 4 Hours. Same as Bioengineering 460. Principles of solute and water transport across natural and synthetic membranes. Natural and artificial membrane structure and function. Passive and active membrane transport processes. Excitability. Irreversible thermodynamics as applied to membrane transport. Prerequisites: EnrE 304, or BioE 355, and consent of the instructor.

461. Biotransport II: Flow Processes. 4 Hours. Same as Bioengineering 461. Principles of flow in living systems. Structure and function of the human circulatory system; rheology of blood and other biofluids; microcirculation; pathological conditions and their detection; gas transport. Prerequisite: EnrE 317 or BioE 355.

491. Specialized Problems. 4 to 12 Hours. Specialized problems under faculty supervision. Prerequisite: Arrangement with the faculty.

493. Current Topics in Energetics. 4 Hours. Particular topics vary from term to term depending on the interests of the students and the specialties of the current instructor. Prerequisite: Consent of the instructor.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Individual research in specialized problems under faculty supervision. Prerequisite: Arrangement with the faculty.

ENGLISH

Jay A. Levine, Head of the Department
Gloria G. Fromm, Director of Graduate Studies

Professors: Paul Carroll, Alan Friedman, Gloria G. Fromm, Chadwick Hansen, John E. Hardy, Alexander Karanikas, Jay A. Levine, Michael Lieb, Louis A. Marder, Ralph J. Mills, John F. Nims, Lawrence S. Poston, Lore Segal (Visiting), John B. Shipley, James B. Stronks, Mary Thale, Samuel A. Weiss, Maurita Willett, Martin L. Wine

Associate Professors: Michael Anania, Preston Browning, Mary Carruthers, Judith K. Gardiner, Brian Higgins, Howard H. Kerr, Robert A. Kispert, Daniel A. Lindley, John P. McWilliams, Jr., Leah S. Marcus, John Mellon, A. LaVonne Ruoff, Gene Ruoff, James P. Sloan, Gerald C. Sorensen

Assistant Professors: Michael R. Brown, Suzanne S. Greene, S. Clark Hulse, John W. Huntington, Jr., Sandra R. Lieb, Sheldon Liebman, Robert Mahony, Christian Messenger, Martin Nystrand, Frederick Stern, Virginia Wexman, Eugene Wildman, Linda Williams

Degree Programs

The Department of English offers courses of study leading to the Master of Arts in English, with specializations in literature (English and American), creative writing, and the teaching of English.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study, and a grade point average in English courses of at least 4.20. In exceptional cases, students who have averages of less than 4.00 but above 3.75 may be admitted if they show substantial evidence of ability to complete the program successfully.

Applicants for admission to the specializations in literature and the teaching of English must have an undergraduate major in English or the equivalent that includes a balanced program in English and American literature beyond the level of sophomore surveys. Applicants for admission to the creative writing program may have an undergraduate major in any field, provided that they show substantial evidence of ability to complete the work in literature required for the degree.

Together with official transcripts as specified in the Graduate College requirement (p. 29), applicants must submit the following unless otherwise exempted:

1. Three letters of recommendation, preferably from professors who are familiar with the applicant's recent work.
2. A statement of about 250 words presenting the applicant's reasons for wishing to take graduate work in English and the relationship of this advanced training to professional and other goals.
3. Graduate Record Examination (GRE) scores for both the general aptitude and advanced literature tests. Ordinarily, the minimum scores on these tests acceptable for admission are at the 60th percentile. The Graduate Record Examination is not required for admission into the program in the teaching of English, but applicants are urged to take the examination.

Applicants for admission to the creative writing program must also submit a sample of their writing (at least five poems, a study, a chapter from a novel, or comparable work).

Foreign applicants should submit GRE scores if it is possible for them to take the examination; otherwise, they may be admitted on limited status and required to take the examination in the first term of residence. Instead of the 250-word statement, they are required to submit a four- or five-page summary of their educational experience that emphasizes their work in English and American literature and language. They should conclude this summary with their reasons for wanting to do graduate work in the United States.

Nondegree Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and provide sufficient evidence (in the form of official transcripts or records) of adequate preparation for the particular courses they wish to take.

Degree Requirements

Credit toward the degree is not given for any course in which the student receives a grade of less than B.

Specialization in Literature

Hours. A minimum of 48 quarter hours of course work, including at least 12 hours at the 400 level, plus English 397 and English 403, is required. At least 36 of the 48 hours must be in English; the remaining 12 hours may be in courses in other departments or disciplines approved by the student's adviser and the director of graduate studies.

Distribution

1. At least one graduate seminar chosen from the following: medieval, Renaissance, eighteenth century, Romantic, American to 1830.
2. At least one graduate seminar chosen from the following: American since 1830, Victorian, modern British, special topics.
3. At least one graduate course in each of the following areas of English literature in which the student has *not* passed an advanced undergraduate course with a grade of B or better: before 1500, Shakespeare, Renaissance through Milton (1500-1660), Restoration—eighteenth century (1660-1789), nineteenth century (1789-1900).
4. At least one graduate course in each of the following areas of American literature in which the student has *not* passed an advanced undergraduate course with a grade of B or better: beginnings through Hawthorne, Melville through the late nineteenth century.
5. At least one graduate course in modern British or American literature in which the student has *not* passed an advanced undergraduate course with a grade of B or better.

Qualifying Paper. Each student submits a qualifying paper (25 to 40 pages) for department approval. It may be an enlarged version of a paper written for a 300- or 400-level course taken as a graduate student or may have originated in independent research. The student may enroll in English 497 for 4 hours of credit to write an acceptable qualifying paper.

Specialization in Creative Writing

Hours. A minimum of 48 hours of course work, including at least 16 hours at the 400 level, is required. Up to 12 hours of tutorials (English 497) or of graduate-level courses may be taken in other departments or disciplines, if approved by the adviser and the director of graduate studies.

Distribution

1. At least 12 but not more than 16 hours of creative writing workshops.
2. At least 20 hours of 300- or 400-level courses in English or American literature.

Qualifying Manuscript. Each student submits a qualifying manuscript for department approval, consisting of a substantial collection of the student's work, such as a volume of poems, a novel, or a collection of stories. A miscellaneous volume, containing, for example, poems, critical essays, and short stories, is also acceptable. As these writings are expected to grow out of the writing workshops, no credit in English 497 will be given for completion of the qualifying manuscript.

Specialization in the Teaching of English

This degree program is designed to meet the needs of secondary school teachers, community college teachers, and curriculum specialists. It is primarily intended for candidates who presently hold a teaching certificate in secondary English; however, the program is also open to students who seek such certification. Course work in education (including supervised practice teaching), which is required for certification, must be carried out in addition to the courses required for the degree.

Hours. A minimum of 48 hours of course work is required, including English 397, English 403, and English 454,* and at least 12 hours at the 400 level in areas 3 and 4 below.

Distribution

1. English literature (8-12 hours, with no more than one course to be chosen from each of the areas listed below): from before 1500 through Milton, Restoration through the nineteenth century, modern, special topics
2. American literature (8-12 hours, with no more than one course to be chosen from each of the areas listed below): From the beginnings through Hawthorne, Melville through the late nineteenth century, modern, special topics
3. Linguistics and rhetoric (any two courses from those listed below): studies in the teaching of English language, linguistics, and composition (English 385,* 386, and English 455); studies in syntax, semantics, and language learning (Linguistics 300, 454, 457, or equivalent: English 301)
4. English education (12 hours, of which at least 4 must be in English 454): English 452—Introduction to Research in English Education; English 453—History of the Teaching of English in the United States; English 387—Adolescent Culture and the Teaching of English;* English 388—Nonprint Media and the Teaching of English;* English 454—Continuing Seminar in English Education;* and courses in the teaching of reading (Education 360, 463, 464, or equivalents)

Courses marked * will be offered, when possible, at various secondary schools and/or community colleges and will involve field work or curriculum design projects to be carried out as part of the candidate's regular teaching assignment.

Examination. Candidates in the teaching specialization are required to pass a comprehensive master's examination (given each spring and fall).

Qualifying Paper. Each student must submit a qualifying paper (25 to 40 pages) for department approval. It may be an enlarged version of a paper written for a course taken as a graduate student, or may have originated in independent research. The student may enroll in English 497 for 4 hours of credit to write the qualifying paper.

Courses for Graduate and Advanced Undergraduate Students

300. History of the English Language. 4 Hours. English in its relationship to other languages; historical account of its development. Prerequisite: Senior standing or 12 hours of English.

301. Modern English. 4 Hours. Critical study of traditional, structural, and transformational grammatical descriptions; detailed survey

of a transformational syntax of English. Prerequisite: Senior standing or 12 hours of English or consent of the instructor.

302. Introduction to Old English. 4 Hours. The elements of Old English grammar and the reading of graded prose selections. Prerequisite: Senior standing or 12 hours of English.

303. Old English Poetry and Prose. 4 Hours. Representative selections of prose and poetry of England to 1200, exclusive of *Beowulf*. Prerequisite: Engl 302 or the equivalent.

304. Beowulf. 4 Hours. A detailed explication of the poem. Prerequisite: Engl 303 or the equivalent.

306. Middle English Literature, Exclusive of Chaucer. 4 Hours. Representative selections; emphasis on the more important lyric, dramatic, and narrative works, such as *Piers Plowman*, *Pearl*, *Gawain*, and *Everyman*. Prerequisite: Senior standing or 12 hours of English.

307. Studies in Medieval English Literature and Language. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

308. Chaucer. 4 Hours. Survey of Chaucer's major works. Prerequisite: Senior standing or 12 hours of English.

310. English Literature of the Renaissance I. 4 Hours. Representative selections; emphasis on Skelton, More, Elyot, Wyatt, Surrey, Lyly, Sidney, Spenser, and Marlowe. Prerequisite: Senior standing or 12 hours of English.

311. English Literature of the Renaissance II. 4 Hours. Representative selections; emphasis on Raleigh, Bacon, Donne, Jonson, Hobbes, Herbert, Browne, and Milton. Prerequisite: Senior standing or 12 hours of English.

312. Renaissance Drama, Exclusive of Shakespeare. 4 Hours. May be repeated for a maximum of 8 hours of credit. Content varies between Tudor drama (Udall, Norton, Sackville, Lyly, Kyd, Marlowe, Dekker, and others) and Stuart drama (Chapman, Marston, Jonson, Beaumont, Fletcher, Webster, Middleton, Rowley, and others). Prerequisite: Senior standing or 12 hours of English.

313. Shakespeare I. 4 Hours. The poems and early plays. Prerequisite: Senior standing or 12 hours of English.

314. Shakespeare II. 4 Hours. The later plays. Prerequisite: Senior standing or 12 hours of English.

315. Milton. 4 Hours. Same as Religious Studies 350. Survey of Milton's poetry and prose, with emphasis on his major works. Prerequisite: Senior standing or 12 hours of English.

316. Major Authors of Renaissance Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a single figure, such as Spenser, Donne, Jonson. Content varies. Prerequisite: Senior standing or 12 hours of English.

317. Studies in Renaissance Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

320. English Literature of the Restoration and Eighteenth Century I: 1660 to 1714. 4 Hours. Representative selections; emphasis on Dryden, Restoration drama, and the early works of Swift and Pope. Prerequisite: Senior standing or 12 hours of English.

321. English Literature of the Restoration and Eighteenth Century II: 1715 to 1744. 4 Hours. Representative selections; emphasis on the early novelists (DeFoe, Richardson, and Fielding) and the later works of Swift and Pope. Prerequisite: Senior standing or 12 hours of English.

322. English Literature of the Restoration and Eighteenth Century III: 1745 to 1789. 4 Hours. Representative selections; emphasis on the Johnson circle and the midcentury novelists (Richardson, Fielding, Sterne, and Smollett). Prerequisite: Senior standing or 12 hours of English.

323. Restoration and Eighteenth-Century Drama. 4 Hours. May be repeated for a maximum of 8 hours of credit. Restoration dramatists (principally Dryden, Etherege, Wycherly, Otway, Shadwell, Vanbrugh, Cibber, and Congreve) and eighteenth-century dramatists (Adison, Steele, Gay, Fielding, Farquhar, Cumberland, Sheridan, Goldsmith, and others). Prerequisite: Senior standing or 12 hours of English.

324. The Eighteenth-Century Novel. 4 Hours. Representative selections; DeFoe, Richardson, Fielding, Sterne, Smollett, and some of the minor novelists of the period. Prerequisite: Senior standing or 12

hours of English.

325. Major Authors of Restoration and Eighteenth-Century Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a single figure, such as Dryden, Swift, Pope, Johnson, Fielding. Content varies. Prerequisite: Senior standing or 12 hours of English.

326. Studies in Restoration and Eighteenth-Century Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

330. English Literature of the Romantic Period I. 4 Hours. Representative selections; emphasis on Blake, Wordsworth, and Coleridge. Prerequisite: Senior standing or 12 hours of English.

331. English Literature of the Romantic Period II. 4 Hours. Representative selections; emphasis on Byron, Shelley, and Keats. Prerequisite: Senior standing or 12 hours of English.

332. Major Authors of the Romantic Period. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a single figure, such as Blake, Wordsworth, Coleridge, Byron, Shelley, Keats. Content varies. Prerequisite: Senior standing or 12 hours of English.

333. Studies in Romantic Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

340. English Literature of the Victorian Period I: Poetry. 4 Hours. Representative selections; emphasis on Tennyson, Browning, Arnold, Swinburne, Hopkins, Hardy. Prerequisite: Senior standing or 12 hours of English.

341. English Literature of the Victorian Period II: Nonfiction Prose. 4 Hours. Representative selections; emphasis on Carlyle, Mill, Newman, Arnold, Ruskin, Pater. Prerequisite: Senior standing or 12 hours of English.

342. English Literature of the Victorian Period III: The Novel. 4 Hours. Representative selections; emphasis on Dickens, Thackeray, Trollope, Eliot, Meredith, Butler, Hardy. Prerequisite: Senior standing or 12 hours of English.

343. Major Authors of Victorian Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a single figure, such as Arnold, Browning, Carlyle, Dickens, Eliot, Mill, Newman, Tennyson, Thackeray, Trollope. Content varies. Prerequisite: Senior standing or 12 hours of English.

344. Studies in Victorian Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

350. Modern British Literature I: 1890 to 1930. 4 Hours. Representative selections; Yeats, Shaw, de la Mare, Conrad, Joyce, Woolf, Lawrence, and others. Prerequisite: Senior standing or 12 hours of English.

351. Modern British Literature II: 1930 to the Present. 4 Hours. Representative selections; Yeats, Auden, Thomas, Spender, Greene, Huxley, Pinter, and others. Prerequisite: Senior standing or 12 hours of English.

352. Modern British Fiction: 1900 to 1945. 4 Hours. Conrad, Joyce, Lawrence, Orwell, Waugh, Woolf, and others. Prerequisite: Senior standing or 12 hours of English.

353. Contemporary British Fiction: 1945 to the Present. 4 Hours. Amis, Fowles, Greene, Murdoch, Powell, and others. Prerequisite: Senior standing or 12 hours of English.

354. Modern Irish Literature: 1880 to the Present. 4 Hours. May be repeated for a maximum of 8 hours of credit. Representative selections; emphasis on George Moore, Wilde, Yeats, Gregory, Synge, Stephens, Joyce, O'Faolain, O'Connor. Prerequisite: Senior standing or 12 hours of English.

355. Major Authors of Modern American and British Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of one or two figures, such as Auden, Conrad, Eliot, Faulkner, Joyce, Hemingway, Shaw, Yeats. Prerequisite: Senior standing or 12 hours of English.

356. Studies in Modern American and British Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

357. Modern British Poetry: 1900 to 1945. 4 Hours. Representative selections; Hardy, Housman, Yeats, Graves, Auden, and others. Prerequisite: Senior standing or 12 hours of English.

358. Developments in Contemporary American and British Poetry. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

359. Developments in Contemporary Fiction. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic, movement, or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

360. Early American Literature: Beginning to 1830. 4 hours. Representative selections from the writers of the colonial, federal, and early romantic periods. Prerequisite: Senior standing or 12 hours of English or consent of the instructor.

361. American Poetry I: Beginnings to 1900. 4 Hours. Representative selections; Taylor, Emerson, Poe, Whitman, Dickinson, and others. Prerequisite: Senior standing or 12 hours of English or consent of the instructor.

362. American Poetry II: 1900 to 1945. 4 Hours. Representative selections; emphasis on Frost, Pound, Eliot, Cummings, Stevens, Williams. Prerequisite: Senior standing or 12 hours of English or consent of the instructor.

363. American Fiction to 1900. 4 Hours. Representative works; Cooper, Melville, Hawthorne, Twain, James, Crane, and others. Prerequisite: Senior standing or 12 hours of English or consent of the instructor.

364. American Fiction: 1900 to 1945. 4 Hours. Representative selections; emphasis on Dreiser, Lewis, Fitzgerald, Hemingway, Faulkner, Wolfe. Prerequisite: Senior standing or 12 hours of English.

365. Contemporary American Fiction: 1945 to the Present. 4 Hours. Representative selections; Warren, Mailer, Ellison, Nabokov, Malamud, Bellow, and others. Prerequisite: Senior standing or 12 hours of English.

366. Major Authors of American Literature through 1914. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a single figure, such as Hawthorne, Melville, Whitman, Dickinson, Howells, James, Twain, and others. Content varies. Prerequisite: Senior standing or 12 hours of English.

367. Periods and Movements in American Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a single topic, such as the American Renaissance, Early National Literature, or the Twenties, or of such movements as Puritanism, Transcendentalism, Realism, Naturalism, or Imagism. Prerequisite: Senior standing or 12 hours of English.

368. Studies in American Literature through 1914. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic or genre. Content varies. Prerequisite: Senior standing or 12 hours of English.

370. Studies in Racial and Ethnic Dimensions of American Literature. 4 Hours. Same as Humanities 370. May be repeated for a maximum of 12 hours of credit. Content varies. Prerequisite: Senior standing or 12 hours of English.

371. Studies in the Oral Tradition of Native Americans. 4 Hours. Same as Native American Studies 371, Philosophy 371, and Religious Studies 371. Content, cultural context, and functions or oral traditions. Styles and performances. Specific topics are announced each term. Prerequisite: Junior standing or NAST 275.

372. Studies in Native American Literature. 4 Hours. May be repeated for a maximum of 8 hours of credit. Same as Humanities 372 and Native American Studies 372. The history and development of literature by and about Native Americans. Content varies. Prerequisites: Senior standing and 12 hours of English or Native American studies.

375. History of Literary Criticism I. 4 Hours. A survey; emphasis on the major critics from Plato to Johnson. Prerequisite: Senior standing or 12 hours of English.

376. History of Literary Criticism II. 4 Hours. Survey of nineteenth-century and modern literary criticism; emphasis on the major critics from Wordsworth to the present. Prerequisite: Senior standing or 12 hours of English.

377. Studies in Literary Criticism. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic or movement.

Content varies. Prerequisite: Senior standing or 12 hours of English.

381. Teaching of English. 4 Hours. Theory and practice; emphasis on current approaches to language and literature. Undergraduate students in the teacher education program must take this course the term preceding their student teaching. Prerequisite: Senior standing or consent of the instructor.

382. Practicum in the Teaching of English. 1 to 8 Hours. May be repeated for a maximum of 8 hours. A maximum of 4 hours may be counted toward the undergraduate major in English. Primarily for prospective teachers in secondary schools. Conducted in designated classroom settings on or off campus. Emphasis on supervised observation and tutoring. Prerequisites: 12 hours of English and consent of the instructor.

383. Teaching English as a Second Language. 4 Hours. Same as Education 383 and Linguistics 383. The methodology of teaching English to residents of the United States who do not speak the language, especially Spanish-Americans. Prerequisite: Engl 300 or 205 or Ling 305.

385. Studies in Teaching the English Language and Linguistics. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic; content varies.

386. Studies in Teaching Rhetoric and Composition. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a topic; content varies.

387. Adolescent Culture and the Teaching of English. 4 Hours. Relationships between English instruction and student attitudes and beliefs. Emphasis on adolescent response to language and literature. Prerequisite: Senior standing or 12 hours of English.

388. Nonprint Media and the Teaching of English. 4 Hours. Same as Communication and Theater 388. The effects of film, television, and technology on the teaching of English. Prerequisite: Senior standing or 12 hours of English.

390. The Writing of Poetry. 4 Hours. May be repeated for a maximum of 8 hours. Advanced practice; emphasis on analysis of student work and on published examples. Prerequisite: Satisfactory completion of Engl 210 or the equivalent.

391. The Writing of Fiction. 4 Hours. May be repeated for a maximum of 8 hours. Advanced practice; emphasis on analysis of student work and on published examples. Prerequisite: Satisfactory completion of Engl 211 or the equivalent.

395. Studies in British and American Drama. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of an author, topic, or movement. Content varies. Prerequisite: Senior standing or 12 hours of English.

397. Backgrounds to English and American Literature. 4 Hours. May be repeated for a maximum of 8 hours of credit. Areas of mythology, mythography, the Bible, and major works of literature important to an understanding of English and American literature. Content varies. Prerequisites: Junior standing and 12 hours of English.

398. Studies in Genres, Modes, Multimedia, Influences, and Movements. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a particular subject in literature. Content varies. Prerequisite: Senior standing or 12 hours of English.

399. Independent Study. 1 to 4 Hours. Open only to English majors and graduate students in English. Admission to this course is only on the advice and initiation of the department. Individual study under the direction of an assigned faculty member. The nature of the work is determined by the tutor on the basis of the student's needs and interests. Prerequisite: Senior standing.

Courses for Graduate Students

400. Introduction to Bibliography and Research. 4 Hours. Recommended for graduate students in English. Detailed study of bibliographic tools and examination of various kinds of research papers.

403. Theory and Practice of Literary Criticism. 4 Hours. Forms and theories of literary criticism, analysis of their application to specific literary genres and works, and practice in writing literary criticism.

405. Seminar on Old English. 6 Hours. A topic in Old English; emphasis on literature or philology. Content varies. Prerequisites: Engl 304 or the equivalent and Engl 403.

406. **Introduction to Old Norse. 4 Hours.** Same as German 436. The grammar of Old Norse and the reading of selected prose and poetry. Prerequisite: A reading knowledge of some other older Germanic dialect, such as Old English, Old Saxon, or Gothic.
415. **Seminar on Middle English Literature. 6 Hours.** Individual conferences on assigned papers are required. Middle English and Middle Scots literature, exclusive of Chaucer. Prerequisites: A minimum of 4 hours of medieval English literature and Engl 403.
416. **Seminar on Chaucer. 6 Hours.** Individual conferences on assigned papers are required. Content varies. Prerequisites: A minimum of 4 hours in medieval English literature and Engl 403.
420. **Seminar on Renaissance Literature. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. One author, topic, movement, or genre. Content varies. Prerequisites: A minimum of 4 hours of Renaissance literature and Engl 403.
421. **Seminar on Shakespeare. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. Prerequisites: A minimum of 4 hours of Shakespeare and Engl 403.
422. **Seminar on Milton. 6 Hours.** Individual conferences on assigned papers are required. Prerequisites: A minimum of 4 hours of Renaissance literature and Engl 403.
425. **Seminar on Restoration and Eighteenth-Century Literature. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. One author, topic, movement, or genre. Content varies. Prerequisites: A minimum of 4 hours of Restoration and eighteenth-century literature and Engl 403.
430. **Seminar on Romantic Literature. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. One author, topic, or movement. Content varies. Prerequisites: A minimum of 4 hours of Romantic literature and Engl 403.
435. **Seminar on Victorian Literature. 6 Hours.** Individual conferences on assigned papers are required. One author, topic, movement, or genre. Prerequisites: A minimum of 4 hours of Victorian literature and Engl 403.
440. **Seminar on Modern American and British Literature. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. One author, topic, movement, or genre. Content varies. Prerequisites: A minimum of 4 hours of modern American or British literature and Engl 403.
445. **Seminar on American Literature. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. One author, topic, or movement. Content varies. Prerequisites: A minimum of 4 hours of American literature and Engl 403.
452. **Research in the Teaching of English. 4 Hours.** Survey of current research methodology and findings in the teaching of language, composition, and literature. Critiques of published research studies and participation in the design and execution of classroom research projects are required. Prerequisite: Admission to the Master of Arts program in English with specialization in teaching.
453. **History of the Teaching of English in the United States. 4 Hours.** A historical survey; special emphasis on the relationships between the English curriculum and social change. Prerequisite: Admission to the Master of Arts program in English with specialization in either teaching or literature.
454. **Seminar on English Education. 4 Hours.** May be repeated for a total of 8 hours. Critical examination of theory and practice in the teaching of literature and language. Content varies. Prerequisite: Admission to the Master of Arts program in English with specialization in either teaching or literature.
455. **Teaching College English 4 Hours.** Satisfactory/unsatisfactory grade only. Methods, materials, and practice in teaching college composition.
470. **Program for Writers: Poetry Workshop. 4 Hours.** May be repeated for a maximum of 12 hours. Emphasis on discussion of poems written by the students. Prerequisite: Admission to the Program for Writers.
471. **Program for Writers: Fiction Workshop. 4 Hours.** May be repeated for a maximum of 12 hours. Emphasis on discussion of fiction written by the students. Prerequisite: Admission to the Program

for Writers.

472. **Program for Writers: Criticism Workshop. 4 Hours.** May be repeated for a maximum of 12 hours. Emphasis on discussion of criticism written by the students. Prerequisite: Admission to the Program for Writers.

473. **Program for Writers: Translation Workshop. 4 Hours.** May be repeated for a maximum of 12 hours. Emphasis on discussion of translation by the students. Prerequisite: Admission to the Program for Writers.

474. **Program for Writers: Nonfiction Workshop. 4 Hours.** May be repeated for a maximum of 12 hours. Emphasis on discussion of non-fiction written by the students. Prerequisite: Admission to the Program for Writers.

475. **Program for Writers: Experimental Writing Workshop. 4 Hours.** May be repeated for a maximum of 12 hours. Emphasis on discussion of experimental writing by the students. Prerequisite: Admission to the Program for Writers.

480. **Seminar on Genres of Literature. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. A single genre, such as poetry, fiction, non-fiction, drama, or literary criticism. Prerequisite: Engl 403.

481. **Seminar on Literature and Related Fields. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. The relationship between literature and such fields as the fine arts, philosophy, psychology, religion, science, and sociology. Prerequisites: A minimum of 4 hours of the area of the literature to be studied and Engl 403.

482. **Seminar on Literary Criticism. 6 Hours.** May be repeated for a maximum of 12 hours of credit. Individual conferences on assigned papers are required. Study of a topic or movement. Content varies. Prerequisites: A minimum of 4 hours of literary criticism and Engl 403.

497. **Research in English. 2 to 8 Hours.** May be repeated for a total of 12 hours of credit. Students are assigned to this course at the discretion of the department. Independent research in English and American literature, linguistics, and creative writing.

499. **Thesis Research. 0 to 16 Hours.** May be repeated for credit. Students are assigned to the course at the discretion of the department. For students involved in thesis research and writing for advanced degrees.

FRENCH

David O'Connell, Head of the Department
Marie-Odile Sweetser, Director of Graduate Studies

Professors: Robert E. Hallowell, Charles M. Lombard, David O'Connell, William M. Schuyler (Emeritus), Franklin P. Sweetser

Associate Professors: Priscilla P. Clark, Peter V. Conroy, Jr., Barbara G. Mittman, June Moravcevic, Kenneth I. Perry, Ellie Ragland-Sullivan, Marie-Odile Sweetser, Dorothy R. Thelander

The department participates in an intercampus program with the Department of French on the Urbana-Champaign campus of the University of Illinois leading to a Master of Arts in French Language and Literature with a thesis or nonthesis option.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. Fluency in written and spoken French and a knowledge of French literature and culture are essential. Applicants must submit three letters of recommendation from former professors, a statement of about 250 words presenting reasons for wishing to take graduate work in French, and Graduate Record Examination scores for both the aptitude test and the advanced test in French.

Degree Requirements

Program A (nonthesis option)

1. A minimum of 48 hours of course work, of which at least 36 hours must be taken in the Department of French, including 20 hours in 400-level courses. With the approval of the adviser, 12 hours of graduate work may be taken in any field in which students are interested and for which they have the prerequisites.

2. Required courses: French 403—*Explication de textes*; two graduate seminars in French literature (French 440); one graduate course in French history to be taken concurrently with one of the seminars in literature. Both courses should deal with the same period, in order that they may complement each other. During the final term in residence, MA candidates must register *in absentia* in French 491X—Individual Topics, a UIUC course, which, however, will be supervised by Chicago Circle faculty and will not require attendance in Urbana-Champaign.

3. A comprehensive oral and written examination covering the main currents of French literature and culture from the Middle Ages to the present.

Program B (thesis option)

1. A minimum of 36 quarter hours of course work, of which 16 hours must be in 400-level courses.

2. A master's thesis (French 499—maximum of 12 hours of credit).

3. Required courses: one graduate seminar in French literature (French 440); French 403—*Explication de textes*; one graduate course in French history dealing with the same period as the seminar or the thesis. During the final term in residence, MA candidates must register *in absentia* in French 491X—Individual Topics, a UIUC course, which, however, will be supervised by Chicago Circle faculty and will not

require attendance in Urbana-Champaign.

4. A comprehensive oral and written examination covering the main currents of French literature and culture from the Middle Ages to the present.

Courses for Graduate and Advanced Undergraduate Students

301. French Literary History I. 4 Hours. Historical development of major genres and movements of the Middle Ages and Renaissance, including *chansons de geste*, medieval romance and poetry; Renaissance Humanism, Reform, the Pleiade and the Baroque. Prerequisite: Fr 203 or consent of the instructor.

302. French Literary History II. 4 Hours. Historical development of the major genres and movements of the seventeenth and eighteenth centuries, including Classicism, the Enlightenment and Preromanticism. Prerequisite: Fr 203 or consent of the instructor.

303. French Literary History III. 4 Hours. Historical development of major genres and movements of the nineteenth and twentieth centuries, including Romanticism, Realism, Naturalism, Symbolism, Surrealism, Modernism, and Post Modernism. Prerequisite: Fr 203 or consent of the instructor.

315. French Literature of the Middle Ages. 4 Hours. Major works of the period. *Chansons de geste*, courtly romances (*Chretien de Troyes* et al.), *Roman de Renard*, poetry, drama. Texts are principally in modern French. Prerequisite: Fr 203 or consent of the instructor.

316. Topics in French Literature of the Sixteenth Century. 4 Hours. May be repeated for a maximum of 12 hours of credit. Intensive analysis of a specialized topic dealing with major authors or selected from major genres such as drama, fiction, poetry, nonfiction. Prerequisite: Fr 203 or consent of the instructor.

317. Topics in Seventeenth-Century French Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Intensive analysis of a specialized topic dealing with major authors or selected from major genres such as drama, fiction, poetry, nonfiction. Prerequisite: Fr 203 or consent of the instructor.

318. Topics in Eighteenth-Century French Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Intensive analysis of a specialized topic dealing with major authors or selected from major genres such as drama, fiction, poetry, nonfiction. Prerequisite: Fr 203 or consent of the instructor.

319. Topics in Nineteenth-Century French Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Intensive analysis of specific topics selected from major genres (drama, fiction, poetry) or dealing with major writers. Prerequisite: Fr 203 or consent of the instructor.

320. Topics in French Literature of the Twentieth Century. 4 Hours. May be repeated for a maximum of 12 hours of credit. Intensive analysis of a specialized topic dealing with major authors or selected from major genres such as drama, fiction, poetry, nonfiction. Prerequisite: Fr 203 or consent of the instructor.

322. Topics in Francophone Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Intensive analysis of a topic on Francophone literature. Prerequisite: Fr 203 or consent of the instructor.

329. Themes in French Literature. 4 Hours. May be repeated for a maximum of 12 hours of credit. Intensive analysis of a specialized theme; topics vary. Prerequisite: Fr 203 or consent of the instructor.

331. Stylistics I: Prose. 4 Hours. Detailed analysis of the style of selected French authors; practice in advanced composition. Prerequisite: Fr 242 or consent of the instructor.

332. Stylistics II: Poetry. 4 Hours. Detailed analysis of the style of selected French authors; practice in advanced composition. Prerequisite: Fr 242 or consent of the instructor.

333. Advanced Conversation. 3 Hours. Discussions and oral presentations based on French current events and culture. Reading and analysis of articles from the French press; emphasis on contemporary French vocabulary in varied cultural contexts. Prerequisite: Fr 232 or consent of the instructor.

343. Advanced Composition. 3 Hours. Intensive review of French syntax; free composition (essay, narrative); translation of texts. Prerequisite: Fr 242 or consent of the instructor.

345. **History of the French Language. 4 Hours.** From its origins to the present. Prerequisite: Fr 203 or consent of the instructor.

361. **French Civilization I. 4 Hours.** Evolution of French civilization from its origins to the end of the sixteenth century. French life and institutions studied in relation to literature; emphasis on social, artistic, and intellectual currents. Lectures and discussion in French. Prerequisite: Fr 203 or consent of the instructor.

362. **French Civilization II. 4 Hours.** Evolution of French civilization in the seventeenth and eighteenth centuries. French life and French institutions studied in relation to literature. Emphasis on social, artistic, and intellectual currents. Lectures and discussions in French. Prerequisite: Fr 203 or consent of the instructor.

375. **French Abroad. 0 to 17 Hours.** May be repeated for credit for a maximum of 51 hours. Lectures, seminars, and practical work in French language, literature, and civilization in France. Prerequisites: Fr 203 and any three of Fr 231, 232, 241, 242; 3.50 overall average, and 3.50 average in French.

383. **Introduction to French Linguistics. 4 Hours.** French phonology, morphology, syntax, and semantics in comparison with English. Prerequisites: Fr 242, 281 or the equivalents.

384. **Applied French Linguistics. 4 Hours.** Methodology, resources, classroom materials, standard practices, and problems in the teaching of French; practical application to actual classroom situations. Prerequisite: Fr 383 or consent of the instructor.

385. **Foreign Language Computer-Assisted Instruction. 4 Hours.** Same as German 340, Slavic Languages and Literatures 340, and Spanish 375. Does not count toward the major. Basic introduction to the use of the TUTOR language and the PLATO IV system in foreign language instruction. Each student designs and implements an instructional module as a term project. Prerequisite: Completion of the intermediate level, or the equivalent, of either French, German, Spanish, or a Slavic language.

399. **Seminar on Selected Topics. 4 Hours.** May be repeated for credit. Specific movements, authors, or works. Topics are announced in the Timetable. Prerequisite: Senior standing and/or consent of the instructor.

Courses for Graduate Students

404. **Modern French Phonetics and Phonology. 4 Hours.** One hour per week in the language laboratory. Phonetic description and transcription. Training in diction and interpretation of literary texts. Phonetics as a teaching device. Prerequisite: Fr 301 or 302 or the equivalent.

405. **The Teaching of College French. 1 Hour.** May be repeated twice for credit. Required of all graduate teaching assistants. Problems of teaching French at the college level, including classroom procedures and the preparation and grading of tests and final examinations. Prerequisite: Teaching assistant in French.

410. **The Pleiade. 4 Hours.** Theory, practice, and esthetics of the *Pleiade* poets.

411. **Montaigne: His Essais and His Age. 4 Hours.** Analysis of the literary, historical, philosophical, and social aspects of the *Essais*. Montaigne's evolution as a writer and thinker.

415. **The Libertins in the Seventeenth and Eighteenth Centuries. 4 Hours.** Intensive study of works not usually covered in courses in seventeenth- and eighteenth-century literature. Prerequisites: Fr 341, 351 or the equivalents.

425. **Pre-Romanticism. 4 Hours.** The pre-Romantic movement in France from 1761 to 1814. Prerequisite: Graduate standing.

426. **La Bataille Romantique. 4 Hours.** Manifestos, polemical writings, and major literary productions of the period.

427. **Romantisme Social. 4 Hours.** Development of Romantic thought after the Revolution of 1830. Social consciousness of Sand, Hugo, Lamartine, Musset, Vigny. The influence of Leroux and Lamennais.

430. **The Use of Greek Mythology in the Contemporary French Theater. 4 Hours.** Greek tragic vision in the works of Cocteau, Giraudoux, and Anouilh. Prerequisites: Fr 342, 370 or the equivalents.

431. **Explication de Textes. 4 Hours.** Detailed critical and stylistic analysis of selected short pieces of French prose and poetry. Lectures, discussion, and student *explications*. Prerequisite: Fr 343.

440. **Seminar for Master of Arts Candidates. 4 Hours.** May be repeated for credit. Topics are announced each term.

475. **French Abroad. 0 to 17 Hours.** May be repeated for credit for a maximum of 51 hours. Lectures, seminars, and practical work in francophone literature and civilization, in a French-speaking country. Prerequisites: Fr 203, 232, 242 or the equivalent; 3.50 overall average; 3.50 average in French courses. Not open to undergraduates.

490. **Independent Study for Graduate Students. 1 to 8 Hours.** May be repeated for credit up to a maximum of 8 hours. Prerequisite: Consent of the head of the department. Fall, Winter, Spring.

499. **Thesis Research. 0 to 12 Hours.** May be repeated for credit. Prerequisite: Approval of the department.

GEOGRAPHY

Clifford E. Tiedemann, Head of the Department
Siim Soot, Director of Graduate Studies

Professors: Lyndon R. Babcock, Jr.,* James M. Blaut, Douglas B. Carter, Edwin N. Thomas

Associate Professors: Edwin H. Draine, Gary L. Fowler, James E. Landing, David M. Solzman, Siim Soot, Clifford E. Tiedemann

Assistant Professors: Bruce G. Gladfelter, Ross Mullner*

*Principal appointment at the University of Illinois at the Medical Center.

The Department of Geography offers work leading to the Master of Arts in Environmental and Urban Geography. The program has two areas of specialization: (1) study in environmental analysis and monitoring, environmental behavior, and environmental management; and (2) urban geography, including the environmental impact of urbanization, industrial and commercial development, transportation, residential area analysis, and urban and regional structures. Specific programs of study are developed by the individual students and faculty advisers from courses in the areas of specialization, supporting electives in geography, and courses offered in cognate disciplines of several colleges in the University and the environmental health program at the Medical Center.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate or its equivalent from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and must submit three letters of recommendation. In exceptional cases, students with averages of less than 4.00 but above 3.75 may be admitted if they can show substantial promise of ability to complete the program successfully. Graduate Record Examination scores (verbal and quantitative test and the advanced test in geography) are required for applicants with a grade point average below 4.00. Prospective students holding degrees in other disciplines are encouraged to apply.

The department accepts the minimum Graduate College requirement for the submission of transcripts (p. 31).

Nondegree Admission

The Department of Geography encourages applications from nondegree students. Applicants need only meet the minimum requirements of the Graduate College. All geography courses are open to nondegree students. Applicants should consult with the director of graduate studies if they are considering applying for regular admission in geography at a later date.

Degree Requirements

Credit Distribution. A minimum of 48 quarter hours of approved graduate work, of which at least 12 hours must be in 400-level geography courses and 12 hours in guided research in the Department of Geography. All students are required to take the core program (Geography 391, 490, and 492) and guided research (Geography 495 and 499). Other courses are selected in accordance with the student's area of specialization. For students with an undergraduate geography major, a minimum of 8 of the 48 hours required for the degree must be in cognate courses recognized by the student's faculty adviser as supporting the student's program of study.

Thesis. Candidates must submit an acceptable thesis based upon original research. Registration for a minimum of 8 quarter hours of Geography 499—Thesis Research is required, but not more than 12 quarter hours may be used for the degree requirements. The student's faculty adviser supervises the preparation of the thesis, and its final form must be approved by the thesis committee following a successful defense.

Comprehensive Examination. The candidate must defend the thesis as part of a comprehensive examination including the area of specialization and elective courses. A candidate who fails the examination will be advised of the preparation necessary for a second examination, which is given no sooner than the last week of the succeeding term. A third examination is not allowed.

Courses for Graduate and Advanced Undergraduate Students

301. Advanced Landform Geography. 4 Hours. The surficial processes modifying the earth's landforms; the control over those processes and their regional settings. Prerequisites: Geog 100, 201. Gladfelter, Fall.

303. Principles of Climatology. 4 Hours. Climatology; macroclimatology and microclimatology; particular emphasis on fluxes of energy and mass at the interfaces between the earth's surface and the atmosphere. The environment and man, plants, and animals; special emphasis on urban microclimatological problems. Prerequisites: Geog 100, 203. Carter, Winter.

306. Fundamentals of Landform Analysis. 3 Hours. Theories of landform processes and techniques of analysis. Prerequisite: Geog 101 or GeolS 102.

310. Principles of Cultural Area Analysis. 4 Hours. Analysis and application of a wide variety of techniques developed to aid in defining, identifying, evaluating, and bounding world cultural areas. Special attention to techniques applicable to urban environments. Examination of development of areal cultural hierarchies through the diffusion mechanisms that create them. Prerequisites: Geog 100, 210. Landing, Fall.

312. Geography of Religions. 4 Hours. Same as Religious Studies 312. Systematic treatment of geographical manifestations of the major religious systems of the world. Special attention to the geographical origins and dispersal mechanisms of religious systems and to the manner in which man organizes his life within the framework of his belief. Intensive study of applications being made in the geographical inquiry on religious systems. Prerequisites: Geog 100, 210. Landing.

315. Principles of Historical Geography. 4 Hours. Development of an understanding of relating phenomena in space through time. Application of contemporary geographic research methodologies to

geographically significant aspects of historic patterns and events. Prerequisites: Geog 100, 215. A.J. Larson, Spring.

320. Ethnogeography. 4 Hours. Cross-cultural analysis of environmental behavior and environmental cognition (ethnoscience), of the systems of resource-use in which these processes are imbedded, and of their relationship to cultural change and technological growth. Prerequisites: Anth 200, Geog 220. Blaut, Spring.

325. Human Migration. 4 Hours. Spatial analysis of the economic, social, and political issues that have resulted from and in human migration among regions; special attention to the important relationships resulting from regional differences. Prerequisites: Geog 100, 225.

326. Decision-Making and Resource Management. 4 Hours. The nature of decision-making schema in resource management; intensive study of approaches used in analyzing resource-management decisions; case studies are analyzed in terms of the reflected character of decisions and strategies, with emphasis on environmental hazards. Prerequisites: Geog 100, 226. Draine, Fall.

330. Location Theory and Spatial Analysis. 4 Hours. Same as Economics 341. Spatial analysis in relation to theories of location of economic activity and regional development; theoretical systems; development and derivation of locational patterns of agricultural, manufacturing, and tertiary activities. Prerequisites: Geog 100 and one course from Geog 230, 231, 233, or Econ 120 and 8 hours of social sciences, or Mktg 360. Business administration students must have declared a major. Spring.

332. Economic Development. 4 Hours. Same as Economics 334. Basic problems and characteristics of underdeveloped countries; classical, neoclassical, and modern contributions to the theory of development; major proposals for accelerating development; basic approaches to economic development; laissez-faire, interventionism; role and methods of planning; foreign aid; economic integration. Prerequisite: Econ 219 or 220 or 221; or Econ 121, Geog 330. Business administration students must have declared a major.

333. Urban Economics. 4 Hours. Same as Economics 332. Survey of economic problems of cities; the nature and function of cities; the demand for and supply of housing and urban land; the implications of location theory for the spatial pattern of cities; the impact of government programs. Prerequisite: Econ 218 or 220 or Geog 330 or UPP 385. Business administration students must have declared a major.

334. Regional Economics. 4 Hours. Same as Economics 342. Theory of location of economic activity, land use patterns, systems of cities, the spatial pattern of city regions, regional growth dynamics, interregional transactions analysis, spatial mobility of factors, regional income differences, regional welfare and policy. Prerequisites: Econ 221 and either 219 or 220; or Geog 100, 230. Business administration students must have declared a major.

335. Geographical Modeling of Transportation Systems. 4 Hours. Same as Economics 343. Discussion of the principles of spatial interaction; emphasis on commodity flows and passenger movements, the practicality of network analysis, and the impact of transportation facilities on land use and regional development. Techniques include simulation and evaluation of existing transportation systems and solutions to theoretical transportation problems. Prerequisites: Geog 100, 235; or Econ 120 and 8 hours of social sciences. Soot, Winter.

350. Areal Organization of Intraurban Systems. 4 Hours. Same as Economics 344. Geographic aspects of intracity relationships. Topics include the city as a complex man-machine system and areal patterns of urban growth and development within the context of cross-sectional and longitudinal models. Prerequisites: One upper-division geographic research methods course, one two-course sequence in systematic geography, and one course in either the 250 or 360 series; or Geog 333. Business administration students must have declared a major. Solzman, Winter.

351. Areal Organization of Interurban Systems. 4 Hours. Geographic aspects of intercity relationships. Topics include patterns of intercity flows and development, continuous and hierarchical ordering of urban places, measurement of areal alignments, and the theoretical implications of different types of areal patterns. Prerequisites: One upper-division research methods course, one two-course systematic sequence, and one course in either the 250 or the 360 series. Solzman, Spring.

361. Problems of the Humid Tropics. 4 Hours. Natural and human aspects of tropical areas; problems of the humid environment relating to landforms, land use, resources, economic and social phenomena

and institutions; emphasis on the development potential of humid, tropical lands. Individual research projects are assigned. Prerequisites: One upper-division research methods course, one two-course systematic sequence, and one course in either the 260 or the 350 series. Cutshall, Spring.

362. Problems of Arid Regions. 4 Hours. Natural and human aspects of arid areas; problems of the arid environment relating to landforms, land use, resources, and economic and social phenomena and institutions; emphasis on the development potential of arid lands. Individual research projects are assigned. Prerequisites: One upper-division research methods course, one two-course systematic sequence, and one course in either the 260 or the 350 series.

370. The Learning and Teaching of Geography. 4 Hours. A formal approach to instructional strategies in geography centered upon the known behavioral and learning characteristics of students. Strong emphasis on material presentation in contemporary urban schools. Prerequisites: Senior standing and declared major in teacher education. Landing, Fall.

381. Geographic Information Systems I. 4 Hours. Same as Urban Planning and Policy 388. Problems encountered in the gathering and use of geographic data and the structuring of research in relation to existing relevant theory, measurement systems capabilities, and recognized objectives of research activities. Topics include review of data sources, methods of measurement, sampling models, and problems of dealing with aggregated reporting units, records matching, and missing data. Prerequisites: Geog 100, 182, 190 (or Math 117, or Soc 185, or QM 272), one 12-hour introductory geography sequence, and one 8-hour systematic geography sequence. Thomas, Fall.

382. Geographic Information Systems II. 4 Hours. Application of inferential statistical techniques and probability models in geographic research. Topics include use of descriptive parameters in recognizing geographic relationships, tests of significance, and recognition of particular areal patterns. Prerequisite: Geog 381. Soot, Winter.

383. Geographic Information Systems III. 4 Hours. Problems encountered in the management and portrayal of geographic data. Topics include preparation of data for manual and machine processing, data condensation and characterization, observation indexing, and the preparation of graphic and tabular displays. Prerequisite: Geog 382. Soot, Spring.

384. Geographic Information Systems IV. 3 Hours. Sources and characteristics of small-area data; problems confronting local users of geographically assigned data. Data management and analysis for special-purpose areawide planning. Focus on special user needs with respect to primary and archival sources of data and information. Data interfaces between special purpose goals and fundamental socioeconomic and demographic variables and elements of spatial structure. Strategies for organizing data and processing for meaningful information retrieval. Computer applications in the preparation of tables, graphs, and maps. Prerequisite: Geog 383.

385. Thematic Cartography. 4 Hours. Discussion and experiments involving graphic representation of real-world areal patterns; preservation of geodetic and information properties; information generalization and reconstructions; semiotic problems and communications capabilities of mapped informational displays. Prerequisite: Geog 285. Tiedemann, Fall.

386. Introduction to Areal Patterns. 4 Hours. The characteristics and evaluation of selected real-world patterns. Application of the concepts of randomness and interdependence to the problem of understanding certain of the physical and cultural processes affecting the arrangement of objects in the landscape. Prerequisite: Geog 286. Tiedemann.

387. Remote Sensing of the Environment. 4 Hours. Principles and practice in interpretation of aerial photographs, radar, and infrared imagery. Knowledge of elementary physics and geometry is recommended. Prerequisite: Geog 287. Tiedemann.

391. Review of Geographic Thought and Research Methods. 4 Hours. Introduction to the theory and techniques of geographic research; modern geographic philosophy; interpretative analysis of bibliographic sources and the preparation of a bibliography; preparation and evaluation of individual papers on selected topics. Prerequisites: Two two-course systematic sequences, one upper-division research methods course, one 300-level urban or regional course, and consent of the instructor. Fowler, Fall.

Courses for Graduate Students

401. Topics in Geomorphology. 3 Hours. May be repeated up to a maximum of 9 hours with alternate themes. The general area of interest is defined by the instructor; students select a specific aspect to be defined, researched, and discussed. Emphasis on individual effort and participation. Prerequisites: Geog 301 and consent of the instructor. Gladfelter, Winter.

403. Seminar on Microclimatology. 3 Hours. May be repeated for up to a maximum of 9 hours of credit. Review and verification of recent findings and reports of research in the significance of the availability of energy, moisture, and various pollutants in the lower atmosphere and their ecological effect. Emphasis on the urban climatic pattern. Prerequisite: Geog 303. Carter, Spring.

410. Seminar on Social and Cultural Geography. 3 Hours. May be repeated up to a maximum of 9 hours. A research course in the analysis of the mechanisms of cultural change with spatial impact. Emphasis on the identification of trait and culture complexes that result in differentially organized areas and the diffusion mechanisms that either accelerate or retard such development. Prerequisite: Geog 310. Landing, Winter.

415. Seminar on Historical Geography. 3 Hours. May be repeated up to a maximum of 9 hours. A research course in the development of expertise in the techniques of analysis through the integration of history and geography. Methodology is centered on macrostudies (evolutionary perspectives on the development of spatial patterns in large areas) and microstudies (small-scale studies of areas or groups). Prerequisite: Geog 315. A.J. Larson, Spring.

426. Seminar on Management and Conservation of Resources. 3 Hours. May be repeated up to a maximum of 9 hours. The role of perception of the environment in resource management. Special attention to geographical research on perception of natural hazards. Needs for further research are examined. Prerequisite: Geog 326. Draine, Fall.

427. Management of Land and Urban Resources. 4 Hours. Same as HB 465 (School of Public Health). Man's use and misuse of the land environment with emphasis on densely populated metropolitan areas. Health, physical, and social environmental aspects of land use. Economics, geography, models; quality-of-life approach. Formal lectures with application to specific, timely case-study projects. Prerequisite: Geog 326 or HB 300 (School of Public Health).

430. Seminar on Spatial Economic Analysis. 3 Hours. Selected theories of location of economic activities and regional growth and development. Topics may include the location of agricultural, manufacturing, and tertiary activities. Primarily economic geography; findings in conventional economic theory and in regional economics; impact on location and on development of behavior of firms and institutions. Topics vary each term. Prerequisite: Geog 330.

435. Seminar on Urban Transportation Systems. 3 Hours. May be repeated up to a maximum of 9 hours. Evaluation of the impact of public and private transit on city land-use structure; review of the degree to which the transit facilities serve the population. Metropolitan transportation systems are contrasted with the social, economic, and ethnic structure of urban areas. Analysis includes practical and theoretical models. Prerequisites: Geog 335, 351 or the equivalents. Soot, Spring.

450. Topics in Urban Geography. 3 Hours. May be repeated for up to 9 hours of credit. The areal organization of metropolitan communities; emphasis on geographic patterns of activities within the city. Geographic aspects of urban systems, with emphasis on the integrating and specialization factors that affect the American urban system. Prerequisites: Geog 350, 351. Thomas, Fall.

459. Seminar on Urban Geography. 3 Hours. May be repeated up to a maximum of 9 hours. Topics vary from term to term. Prerequisite: Geog 450.

460. Concepts of Regional Growth and Development. 3 Hours. The concept of a region. Interregional income differentials. Factor mobility, determinants of regional growth, regional development strategies. Prerequisites: Geog 361 and 362 or credit in one and concurrent registration in the other.

469. Seminar on Regional Development. 3 Hours. May be repeated up to a maximum of 9 hours. Analysis of the role of resources in regional development, with emphasis on integrated river-basin development. Specific topics may change from year to year. Prerequisite: Geog 460. Fowler.

470. Seminar on Geographic Learning. 3 Hours. May be repeated up to a maximum of 9 hours. Research course involving applications of modern learning theory to the teaching of geographic concepts. Emphasis on teaching techniques that will maximize geographic information flow with minimal energy expenditure for both student and teacher. Experience with learners at various levels is an integral part of the work. Prerequisite: Geog 370.

481. Spatial Analysis in Geography. 3 Hours. May be repeated up to a maximum of 9 hours. The role of hypothesis testing in geographic research. Methods of testing spatial associations, ranging from simple correlation to generalized mapping surfaces. Emphasis on residual analysis and the related problems of autocorrelation and varying unit size. Prerequisites: Geog 381, 382, 383 or the equivalents.

490. Geographic Field Research Methodology. 4 Hours. A problem-oriented introduction to primary data collection in geographic research. Group and individual involvement in formulation and analysis of small-area research problems. Written and oral reports on individually assigned projects are evaluated by a faculty committee. Several all-day field trips are required. Prerequisite: Credit or concurrent registration in Geog 391.

492. Frontiers in Geographic Research. 2 Hours. Required of all graduate geography majors. A formal, intensive examination of contemporary geographic research in the various subfields of the discipline. Prerequisites: Geog 391, 490. Fowler, Winter.

494. Special Readings in Geography. 1 to 4 Hours. May be repeated up to a maximum of 8 hours. Independent readings on an approved topic for those desiring further acquaintance with advanced thought and methodology in geography without involvement in a research project or a field study. Prerequisite: Approval of the department student adviser.

495. Special Studies in Geography. 1 to 4 Hours. May be repeated for credit up to a maximum of 8 hours. Independent research on an approved topic not related to thesis preparation. Prerequisite: Approval of the department student adviser.

499. Thesis Research in Geography. 0 to 12 Hours. May be repeated for credit up to a maximum of 12 hours. Independent research on a topic approved for a graduate thesis. Prerequisite: Approval of the appropriate department committee.

GEOLOGICAL SCIENCES

Norman D. Smith, Acting Head of the Department
August F. Koster van Groos, Director of Graduate Studies

Professors: Werner H. Baur, Robert E. DeMar, Edward Olsen (Adjunct, Field Museum), Norman D. Smith

Associate Professors: John R. Bolt (Adjunct, Field Museum), Warren C. Forbes, Jr., August F. Koster van Groos, Kelvin S. Rodolfo

Assistant Professors: Stephen J. Guggenheim, N. Luanne Vanderpool, Jean L. Younker, Leland W. Younker

Admission Requirements

Regular Admission

Geology students with strong backgrounds in biology, chemistry, mathematics, and physics and engineers with strong backgrounds in hydrology and soil mechanics are encouraged to apply, although students who have degrees in other sciences or engineering fields are considered.

Applicants are considered on an individual basis. They must have a baccalaureate in geology, engineering, or related fields from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter

hours (60 semester hours) of undergraduate study and must submit three letters of recommendation, preferably from professors familiar with their academic work, and Graduate Record Examination (quantitative and verbal test) scores. In exceptional cases, students who have averages of less than 4.00 but above 3.75 or practicing geoscientists and engineers who wish to return to school for graduate instruction may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Depending on their qualifications and background, such students may be admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status.

The department offers graduate work leading to the Master of Science and, in cooperation with the Departments of Energy Engineering and Materials Engineering, advanced work in geotechnical engineering and geosciences leading to the Doctor of Philosophy in Engineering. The student's program is determined by the area of specialization and is worked out in consultation with the adviser.

The department accepts the minimum Graduate College requirement regarding the submission of transcripts (p. 31).

Nondegree Admission

The department can accept a small number of nondegree students each year. The minimum requirements of the Graduate College regarding nondegree admissions are acceptable in most cases. Interested persons are urged to contact the department's director of graduate studies before making application to a nondegree program.

Degree Requirements

Master of Science

Hours. 48 quarter hours, 24 of which must be in the area of concentration. A minimum of 16 quarter hours must be taken in 400-level courses, 8 of them in the area of concentration. Twenty quarter hours must be taken from among the following courses:

Geological Sciences 300 or 310, 315, 320, 330 or 350, 335, 340, 355, 360, 375, 385.

One or more of these requirements can be waived if the student can demonstrate competence in the subject areas of these courses. Such waivers must be approved by the head of the department.

Thesis. The student must complete a thesis in a research project selected with the approval of the faculty adviser. The department may request the student to take a comprehensive examination in the area of specialization. The thesis is evaluated by a department committee that may include one member selected from outside the UICC faculty.

Candidates must demonstrate competence in reading the scientific literature of at least one foreign language. French, German, and Russian are the preferred languages.

Doctor of Philosophy

To become a candidate for the doctorate, a student must pass a qualifying examination to be taken within one term of the completion of the requirements for an MS. A student who has an MS from another institution or department must take the qualifying examination within two terms of admission as a graduate student. It may be retaken once if so recommended by the examination committee.

Approximately 48 quarter hours of course work beyond the MS (or the equivalent) are required. Toward the end of the course work, the student is required to pass a preliminary examination administered by a faculty committee.

A major requirement of the PhD program is the completion of a thesis based on original research, which is carried

out and the thesis written under the supervision of a faculty committee of at least five members. The thesis must be defended before the committee and the public in an examination, notice of which appears in an official campus publication.

The number of credit hours required for the doctoral thesis is flexible and is adjustable in accordance with the regulations of the Graduate College. Although formal thesis research often does not start until completion of the preliminary examination requirements, it is also common to initiate an informal research program while the student is still involved in course work.

Foreign language proficiency is not required.

Courses for Graduate and Advanced Undergraduate Students

300. Mineralogy. 4 Hours. Crystal chemistry and phase equilibria of minerals and mineral assemblages. Prerequisites: Chem 114, GeolS 201. Guggenheim, Winter.

310. Igneous and Metamorphic Petrology. 4 Hours. Discussion of petrogenesis; application of thermodynamic principles to the crystallization of rocks. Prerequisites: Chem 114, GeolS 210. Koster van Groos, Winter.

315. Sedimentology. 4 Hours. Composition, texture, and structures of sediments and sedimentary rocks. Environmental factors that control sediment genesis. Theory and techniques of modern sedimentology. Prerequisites: Chem 114, GeolS 215, and credit or concurrent registration in Math 131. N.D. Smith, Fall.

316. Invertebrate Paleontology. 4 Hours. Same as Biological Sciences 316. Phylogeny, morphology, and ecology of the fossil invertebrates. Prerequisites: GeolS 218 and consent of the instructor. J. Younker, Winter.

317. Field Geology. 6 to 9 Hours. Application of mapping and other field techniques at a summer field camp for a period of six weeks. Prerequisites: GeolS 110, 200, 210, and 320. DeMar, Rodolfo, Summer.

318. Vertebrate Paleontology. 4 Hours. Same as Biological Sciences 318. Phylogeny, morphology, and ecology of the fossil vertebrates. Prerequisites: BioS 281 and consent of the instructor. Bardack, DeMar, Winter.

319. Paleobotany. 5 Hours. Same as Biological Sciences 319. Structure, phylogeny, and stratigraphic distribution of representative fossil plants. Lecture, laboratory, and field trips. Prerequisite: One year of biological sciences. Eggert.

320. Analysis of Geologic Structures. 4 Hours. Elementary stress and strain relations for earth materials. Nature and origin of folds and faults. Structural petrology. Deformation of the earth's crust. Prerequisites: Math 130 and credit or concurrent registration in Phys 101 or 111.

321. Paleocology. 4 Hours. A synthesis of life habits, death, and burial of organic groups that commonly preserved as fossils. Definition of relationships between ancient organisms and their habitats. Diagnosis of ancient terrestrial and marine environments and patterns of environmental change. Prerequisite: GeolS 215 and 218 or consent of the instructor. J. Younker, Fall.

330. Environmental Geology. 4 Hours. Geological aspects of man's environment; emphasis on the earth's processes, resources, and physical properties of rocks and soils insofar as they are important to or in some way affect human activities. Prerequisites: Credit or concurrent registration in Math 132 and GeolS 225.

335. Geochemistry. 4 Hours. Principles of the distribution of the elements in the earth's crust. Element partitioning between coexisting minerals; origin of the elements. Introduction to thermodynamic consideration of mineral equilibria. Prerequisite: Chem 114.

337. Electron Microprobe Analysis. 4 Hours. Principles and techniques. Prerequisite: Phys 142 or the equivalent or consent of the instructor.

340. Economic Geology of Mineral Deposits. 4 Hours. Principles of mineral deposition, exploration, and exploitation. Distribution of economic minerals. Prerequisite: GeolS 210, 215.

345. Advanced Crystallography. 4 Hours. Crystalline properties of minerals. Theory and practice of determining the crystalline structure

of minerals. Prerequisite: GeolS 300. Baur, Guggenheim, Winter.

350. Hydrogeology. 4 Hours. The occurrence, storage, movement, and quality of water in rocks of the earth's crust. Prerequisite: Math 132.

355. Geology of Energy Resources. 4 Hours. Introduction to the nature, origin, and distribution of fossil fuels in the earth's crust. Emphasis on the geology of petroleum and natural gas, coal, oil shale and tar sand, uranium, and geothermal deposits. Prerequisites: GeolS 215, 320. Rodolfo, Winter.

360. Introductory Heophysics. 4 Hours. The shape and figure of the earth, gravity, seismology, and magnetism. Thermodynamics of the earth; atmospheric and planetary geophysics. Prerequisite: Consent of the instructor. L. Younker, Winter.

365. Statistical Methods in Geology. 4 Hours. Introductory course. Sampling from geological populations, statistical inference, and hypothesis testing; statistics of orientation data; trend surface methods; multivariate correlation techniques; time series analysis. Prerequisite: Math 370. Vanderpool, Fall.

370. Engineering Geology. 4 Hours. Applications of geology to major engineering problems and operations. Prerequisites: Math 132, Phys 141; or consent of the instructor. Vanderpool, Winter.

375. Computer Applications in Geology. 4 Hours. An introduction. Machine contouring, trend surface analysis, and spatial filtering. Graphic correlation, factor analysis, and classifications systems. Simulation of geological processes, geologic sampling, and spatial variation. Prerequisite: Math 195. Vanderpool, Fall.

377. Models in Geomorphology. 4 Hours. Evolution of landforms. Emphasis on quantitative and semiquantitative analyses of the physical processes that modify land surfaces. Prerequisites: GeolS 101 or Geog 101 or Geog 103, Math 132, Phys 101 or 141; or consent of the instructor. Vanderpool, Spring.

385. Geophysical Exploration. 4 Hours. Introduction to methods of geophysical exploration. Interpretation of seismic data, gravity and magnetic anomalies, and electrical and electromagnetic surveys. Laboratory includes field investigations. Prerequisites: Math 133, GeolS 360. L. Younker, Spring.

390. Topics in Modern Geology. 4 Hours. Discussion of current research topics. Prerequisites: Senior standing and 20 hours of advanced courses in geological sciences. Koster van Groos, Winter.

Courses for Graduate Students

410. Advanced Petrology. 4 Hours. May be repeated for credit. Selected topics; generation and properties of magmas, formation of metamorphic rocks. Reaction rates in metamorphic rocks. Prerequisites: GeolS 310 and consent of the instructor. Koster van Groos, Winter.

413. Problems in Evolutionary Paleontology. 4 Hours. Same as Biological Sciences 413. Seminar on current problems. Discussion of evidence and mechanisms of change, such as rates of evolution, population structure, and extinction as shown by vertebrate fossil record. Prerequisite: Consent of the instructor. J. Younker, DeMar, Spring.

415. Advanced Sedimentology. 4 Hours. May be repeated. Advanced topics in one of the following: clastic sedimentation models, carbonate sedimentology, sediment transport and sedimentary petrology. Lectures, seminar, and laboratory. Prerequisites: GeolS 315 and consent of the instructor. N.D. Smith, Winter.

420. Advanced Vertebrate Paleontology. 4 Hours. May be repeated twice for credit. Same as Biological Sciences 420. Given as three different courses. Advanced treatment of the functional morphology, paleocology, and phylogeny of the various vertebrate groups: fishes, amphibians and reptiles, and mammals. Prerequisites: BioS 282, GeolS 318. DeMar, Spring.

430. Advanced Mineralogy. 4 Hours. May be repeated if the same topic is not covered twice. Various topics in one of the following categories: structural mineralogy, X-ray crystallography, optical properties of minerals, and crystal chemistry and mineral synthesis. Lectures, seminars, and laboratory. Prerequisites: GeolS 210 and consent of the instructor. Guggenheim, Winter.

432. Advanced Geochemistry. 4 Hours. May be repeated if the same category is not covered twice. Advanced topics in one of the following categories: isotope geochemistry and geochronology, distribution of elements in the earth's crust, mineral systems with and without

volatile components, and low-temperature mineral systems. Lectures, seminars, and laboratory. Prerequisites: GeolS 335 and consent of the instructor. Koster van Groos.

440. Advanced Ground-Water Hydrology. 4 Hours. May be repeated if the same topic is not covered twice. Selected topics. Prerequisites: GeolS 350 and credit or concurrent registration in Math 220.

460. Marine Geology. 4 Hours. Origin and nature of marine sediments, tectonics and geomorphology of the ocean floor, including methods of mapping and measuring submarine topography. Prerequisite: Consent of the instructor. Rodolfo, Fall.

495. Advanced Studies in Geology. 2 to 8 Hours. May be repeated twice. Independent study or research, under a faculty supervisor, culminating in a written report. Work may be undertaken in the following fields: stratigraphy, sedimentation, paleontology and paleoecology, vertebrate paleontology, mineralogy and petrology, crystallography, geochemistry, engineering geology, oceanography. Prerequisite: Consent of the head of the department and the faculty member who will supervise the study.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Only 8 hours are allowed toward the 48-hour requirement for the Master of Science. Individual work under the supervision of faculty members in their respective fields. Prerequisite: Consent of the thesis supervisor and the head of the department.

GERMAN

Leroy R. Shaw, Acting Head of the Department and Director of Graduate Studies

Professors: Robert R. Heitner, Lee B. Jennings, Robert Kauf, Karl F. Otto, Jr., Leroy R. Shaw, Hazel C. Vardaman

Associate Professors: Heinz C. Christiansen, Arnold J. Har-toch

Assistant Professors: Bruce M. Broerman, Luise H. Hathaway, David M. Weible

Work leading to the Master of Arts is offered in two areas of specialization: German literature and German philology and linguistics. In addition, the department participates in an intercampus program with the Department of German on the Urbana-Champaign campus of the University of Illinois that offers work leading to the Doctor of Philosophy in German. Students admitted to this program will be required to take at least one semester of full-time academic work on the Urbana-Champaign campus.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. However, an applicant must have a bachelor's degree with a major in German from an accredited institution or the equivalent from a foreign university. Those whose undergraduate preparation in German is deemed inadequate may be admitted at the discretion of the department but will be required to take supplementary course work on the undergraduate level. Applicants are expected to have a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and in all courses in German. In exceptional cases, those who have averages between 3.75 and 4.00 may be considered, if they can show evidence of substantial promise of ability to complete the program successfully.

The Department of German requires transcripts in accord with the general statement of the Graduate College (p. 31).

Nondegree Admission

The Department of German will accept persons wishing nondegree status. A transcript from the institution that awarded the baccalaureate should be presented.

Degree Requirements

Program A (*nonthesis option*)

1. A minimum of 48 hours of course work, including at least 36 hours in the major field, 18 of which must be in 400-level courses. Of these 18 hours, at least 8 must be in regularly scheduled courses exclusive of German 490—Independent Study.
2. At least one graduate seminar in German.
3. A one-hour oral examination and a three-hour written comprehensive examination.

Program B (*thesis option*)

1. A minimum of 36 quarter hours of course work, including at least 24 hours in the major, 18 of which must be in 400-level courses. The additional 12 quarter hours (to total 48) will be earned through enrollment in German 499—Thesis Research.
2. At least one graduate seminar in German.
3. A master's thesis.

Courses for Graduate and Advanced Undergraduate Students

320. Writing and Speaking German V. 4 Hours. Prerequisite: Ger 204 or the equivalent.

321. Writing and Speaking German VI. 4 Hours. Prerequisite: Ger 320 or the equivalent.

340. Foreign Language Computer-Assisted Instruction. 4 Hours. Same as French 385, Slavic Languages and Literatures 340, and Spanish 375. Does not count toward the major. Basic introduction to the use of the TUTOR language and the PLATO IV system in foreign language instruction. Each student designs and implements an instructional module as a term project. Prerequisite: Completion of the intermediate level, or the equivalent, of either German, French, Spanish, or a Slavic language.

350. German for Reading and Translation I. 4 Hours. Basic components of German grammar, sentence structure, and vocabulary. Selected texts in humanities, social sciences, and natural sciences. May not be taken for credit in German major or minor; may not be taken for credit by students who have completed elementary and intermediate German sequences; does not satisfy the graduation requirement in foreign languages in LAS.

351. German for Reading and Translation II. 4 Hours. Reading of specialized texts in the humanities, social sciences, and the natural sciences including both primary and secondary sources. May be counted toward the German minor; open as an elective to students who have completed two years of basic German. Does not satisfy the graduation requirement in foreign languages in LAS. Prerequisite: German 350 or the equivalent or consent of the instructor.

361. German Abroad. 0 to 17 Hours. May be repeated for credit for a maximum of 51 hours. Taken in Austria. Lectures, seminars, and practical work in German language, literature, civilization, and teaching methods. Prerequisites: Ger 201 and 202 or the equivalents, 3.75 overall grade point average, and 4.00 average in German.

370. The German Novelle. 4 Hours. Reading and interpretation of representative *Novellen* of the nineteenth and twentieth centuries. Prerequisites: Ger 221 and two additional German literature courses.

372. German Drama. 4 Hours. Development from the Enlightenment to the present. Prerequisites: Ger 221 and two additional German literature courses.

374. Poetry from the Seventeenth Century to the Present. 4 Hours. Prerequisites: Ger 221 and two additional German literature courses.

380. Goethe's Faust. 4 Hours. Intensive study of Parts I and II.

Prerequisites: Ger 221 and two additional German literature courses.

382. **German Literature to 1750. 4 Hours.** Prerequisites: Ger 221 and two additional German literature courses.

385. **Germanic Linguistics. 4 Hours.** Linguistic geography, *Sprachschichten*, and principles of structural linguistics. Prerequisite: Ger 203 or the equivalent.

390. **Topics in German Literature. 4 Hours.** May be taken more than once for credit. Reading and discussion of the work of one prominent German author or of a group of related authors. Subject varies and is chosen by the instructor. Prerequisites: Ger 290, 292, 294.

Courses for Graduate Students

404. **Theories of German Phonetics and Phonology. 4 Hours.** Introduction to phonological and phonetical analysis of the German language. Prerequisite: Consent of the instructor.

405. **History of the German Language. 4 Hours.** Structural and lexical development.

408. **Bibliography and Research Methods. 4 Hours.**

410. **Middle High German. 4 Hours.**

415. **German for Teachers. 4 Hours.** May be repeated for a maximum of 8 hours of credit. Primarily for inservice German teachers. Training and practice in the use of modern German colloquial language. Particular emphasis on oral communication. Prerequisite: Inservice status as a teacher of German or consent of the instructor.

420. **Medieval Literature. 4 Hours.** German literature from 1100 to 1400. Prerequisites: Ger 382 or 410 or the equivalents.

421. **Renaissance and Reformation Literature. 4 Hours.** Prerequisite: Ger 382 or the equivalent.

422. **Baroque Literature. 4 Hours.** Prerequisite: Ger 382 or the equivalent.

423. **Enlightenment and Sturm und Drang Literature. 4 Hours.**

425. **Goethe and Schiller—The Weimar Period. 4 Hours.**

426. **Romanticism. 4 Hours.** Literature, theories, and philosophy of eighteenth- and nineteenth-century German Romanticism.

427. **Poetic Realism. 4 Hours.** German literature between Romanticism and Naturalism.

428. **Modern German Literature from 1890 to 1930. 4 Hours.**

429. **Contemporary Literature. 4 Hours.** German drama, lyric, and narrative prose from 1930 to the present.

432. **Old High German. 4 Hours.** Introduction to sounds, morphology, and syntax. Reading of Old High German literary texts. Prerequisite: Ger 405.

434. **Gothic. 4 Hours.** Introduction to sounds, morphology, and syntax. Reading of Gothic literary texts. Prerequisite: Ger 405.

436. **Introduction to Old Norse. 4 Hours.** Same as English 406. The grammar of Old Norse and the reading of selected prose and poetry. Prerequisite: A reading knowledge of some other older Germanic dialect, such as Old English, Old Saxon, or Gothic.

440. **Seminar on Literature. 4 Hours.** May be repeated for credit. Topics vary. Prerequisite: Consent of the instructor.

441. **Seminar on Linguistics. 4 Hours.** May be repeated for credit. Topics vary. Prerequisite: Consent of the instructor.

448. **The Structure of Modern German. 4 Hours.** Structural analysis of modern High German by means of modern European and American methods. Prerequisites: Ger 385, 405.

490. **Independent Study for Graduate Students. 1 to 4 Hours.** Prerequisite: Consent of the instructor.

499. **Thesis Research. 0 to 16 Hours.** May be repeated for credit. Prerequisite: Consent of the instructor.

HISTORY

Leo Schelbert, Chairperson of the Department
Edward C. Thaden, Director of Graduate Studies

Professors: Shirley A. Bill, Peter J. Coleman, Carolyn A. Edie, Bentley B. Gilbert, Robert L. Hess, Melvin G. Holli, George Huppert, Francis Jennings (Adjunct), Richard Jensen, Peter d'A. Jones, Stanley Mellon, Robert L. Nicholson (Emeritus), Robert V. Remini, John Tedeschi (Visiting), Edward C. Thaden, John B. Wolf (Emeritus)

Associate Professors: Burton Bledstein, James Cracraft, Gerald Danzer, Richard M. Fried, William A. Hoisington, David P. Jordan, Ronald P. Legon, Richard Levy, Peter R. McKeon, Richard Millman, Herman Ooms, Michael Perman, Leo Schelbert, Daniel S. Smith

Assistant Professors: Jon Butler, Bruce J. Calder, LaRay Denzer, Perry R. Duis, John Kulczycki, Allen Kulikoff (Visiting), Robert L. Messer, Marion S. Miller, James J. Sack, Mary K. Vaughan

The Department of History offers work leading to the Master of Arts and the Doctor of Philosophy. In addition to the regular MA program, the department offers a special program designed to meet the needs of high school teachers, leading to the MAT.

All students are required to register for a minimum of 8 quarter hours in the fall, winter, and spring quarters, except those students in the MAT program.

Students must concentrate in one of the following major fields for both the MA and the MAT: Africa, ancient world, early modern Europe, East Asia, Great Britain, Latin America, medieval Europe, modern Europe, Russia and East Europe, United States. The PhD major fields are Africa, Britain since 1485, Europe 1450-1815, Europe since 1648, France, Italy, Latin America, Russia, United States 1500-1877, United States since 1765. Each major field is further subdivided into minor fields, of which there are more than 90 for the MA and more than 60 for the PhD. A complete listing of all fields is included in the graduate student handbook, which also contains a more detailed explanation of the regulations and procedures of the department. All students are urged to obtain a copy of the handbook from the department's graduate secretary.

Master of Arts for Teachers. The MAT provides a wide exposure to history, an understanding of historical methodology and practice, and preparation in a field outside history. The program emphasizes the development of teaching strategies and instructional materials. A person who enters the program without professional certification for high school teaching may gain certification through additional work. Such arrangements must be made in advance.

Urban Studies and Black History. Graduate students have an opportunity to pursue research in American urban studies and Black history in the University's Urban History Manuscript Collection, a rich repository of materials dealing with the social, economic, and political history of the United States and particularly with the history of the metropolitan Chicago area. Through the materials in this collection, students in history are trained in the use of manuscripts as well as other primary materials employed in the study and writing of history.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of under-

graduate study, and either an undergraduate major in history or a minimum of 24 quarter hours in history. Students who have averages below 4.00 but above 3.75 may be considered. Three letters of recommendation from former professors and a minimum of two years of undergraduate training in a foreign language are required. Students are required to take the aptitude portion of the Graduate Record Examination. Applicants are urged to take the advanced history section of this examination, although it is not required. Applicants who do not have an adequate background must remedy deficiencies in their preparation before being granted full standing in the graduate program. The minimum transcript requirement of the department is the same as that of the Graduate College.

The department accepts nondegree students who have earned a baccalaureate or its equivalent from an accredited college or university.

Degree Requirements

Master of Arts

Hours. The candidate must complete a minimum of 48 quarter hours of graduate work. At least 20 of these hours must be at the 400 level, of which at least 16 must be in history courses. Credit toward the degree is not given for any course in which the student receives a grade of less than B.

Language or Research Skill. The student is required to pass a reading examination in at least one foreign language relevant to the plan of study. When appropriate, some other research skill, such as archeology, paleography, or quantitative methods, may be substituted.

Comprehensive Examination. The candidate must pass a comprehensive examination in one major and two minor fields. At least one of the minor fields must be outside the area of the major field. With the approval of the department one of the minor fields may be in an area outside of history. Normally the student takes at least 12 quarter hours of work in preparation for the examination in each of the two minor fields. Candidates concentrating in United States history are required to complete, in preparation for the examination, the three-quarter bibliographical colloquium.

Thesis. A thesis is not required. The candidate must complete a seminar paper.

Master of Arts Program for Teachers

Hours. The candidate must complete a minimum of 48 quarter hours of graduate work. At least 24 of these hours must be at the 400 level, of which at least 20 must be in history courses. Credit toward the degree is not given for any course in which the student receives a grade of less than B.

Language or Research Skill. None.

Comprehensive Examination. The candidate must pass a comprehensive examination in one major and two minor fields. One of the two minor fields is ordinarily in a discipline other than history. Normally the student takes at least 12 quarter hours in each of the three fields. In addition, the student must present 12 quarter hours of work in a special colloquium in the teaching of American, European, and world history. Candidates concentrating in United States history are required to complete, in preparation for the examination, the three-quarter bibliographical colloquium.

Thesis. A thesis is not required.

Doctor of Philosophy

Students admitted to the program who do not have a master's degree in history may be required to take the master's comprehensive examination. After their first term in residence, they may also be required to take an oral examination.

Hours. The candidate must complete at least 96 quarter hours of graduate work beyond the MA. Of this amount approximately 48 quarter hours is done in courses and approximately 48 quarter hours in thesis research (History 499). Credit toward the degree is not given for any course in which the student receives a grade of less than B.

Language or Research Skill. The student is required to pass a reading examination in at least two foreign languages relevant to the plan of study. When appropriate, some other research skill, such as archeology, paleography, or quantitative methods, may be substituted for one of the languages.

Preliminary Examination. All students must pass an oral and written preliminary examination in one major and three minor fields. Two of the minor fields must be either geographically or chronologically outside of the major field. The candidate may offer one minor field in a discipline other than history.

Thesis. Students must write and defend a dissertation that is an original contribution to historical scholarship.

Courses for Graduate and Advanced Undergraduate Students

Note: Graduate students must have background or training appropriate to the content of any 300-level course.

301. Topics in Ancient History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisites: 4 hours of history or consent of the instructor.

302. Topics in Greek History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of ancient history.

303. Topics in Roman History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of ancient history.

306. Topics in Medieval History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of medieval history.

309. Topics in the Renaissance. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

311. Topics in Sixteenth-Century European History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

312. Topics in Seventeenth-Century European History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

313. Topics in Eighteenth-Century European History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

314. Topics in Nineteenth-Century European History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

316. Topics in Twentieth-Century European History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

318. Topics in German History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

321. Topics in British History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

324. Topics in French History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

329. Topics in Italian History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

333. Topics in Eastern European History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

335. Topics in Russian History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of European history.

341. Topics in African History. 4 Hours. Same as Black Studies 341. Study in depth of specific problems of internal African history, with concentration on such topics as the African role in the slave trade, the growth and decline of African states, African syntheses with European culture, or the African reaction to European domination and conquest. Prerequisite: 4 hours of African history.

349. African History Seminar Abroad. 8 to 16 Hours. Same as Black Studies 349. Lectures, seminars, and independent study in Africa for one term. Prerequisites: 8 hours of African history and consent of the instructor.

351. Topics in Colonial American History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of United States history.

352. Topics in Revolutionary and Early National United States History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of United States history.

353. Topics in Nineteenth-Century United States History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of United States history.

354. Topics in Twentieth-Century United States History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of United States history.

355. Topics in the History of Chicago. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: Hist 255 or 256.

361. Topics in Latin American History. 4 Hours. May be repeated for credit. Same as Latin American Studies 361. Specific topics are announced each term. Prerequisite: 4 hours of history.

362. Topics in Caribbean History. 4 Hours. Same as Latin American Studies 362. Specific topics having either a national or trans-Caribbean thematic focus are announced each term. Prerequisite: Hist 285 or 286.

363. Topics in Mexican History and the History of the Mexican People in the United States. 4 Hours. Same as Latin American Studies 363. In-depth study of such topics as Chicano labor history, Chicano oral history, peasants in the Mexican Revolution, and relations between Mexico and the United States within the framework of dependency. A specific topic is announced each term. Reading knowledge of Spanish may be helpful but is not essential. Prerequisite: 8 hours of 200-level Latin American or Chicano history.

364. Topics in Brazilian History. 4 Hours. May be repeated for credit. Same as Latin American Studies 364. Specific topics are announced each term. Prerequisite: 4 hours of history.

371. Topics in East Asian History. 4 Hours. May be repeated for credit. Same as Asian Studies 301. Specific topics are announced each term. Prerequisite: 4 hours of East Asian history.

377. Topics in Middle Eastern History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history or consent of the instructor.

380. Topics in Economic History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

381. Topics in Social History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

382. Topics in Migration History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history. Schelbert, Spring.

383. Topics in the History of Public Policy. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of United States history.

384. Topics in the History of Women. 4 Hours. May be repeated for credit. Same as Women's Studies 384. Specific topics are announced each term. Prerequisite: 4 hours of history.

385. Topics in Business History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: Hist 291 or 292 or 4 hours of United States history or consent of the instructor.

388. Topics in Early Urban History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours

of history.

389. Topics in Later Urban History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

390. Topics in Diplomatic History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

391. Topics in Constitutional History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

392. Topics in Intellectual History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

393. Topics in the Development of Historical Literature. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

394. Topics in Political History. 4 Hours. May be repeated for credit. Specific topics are announced each term. Prerequisite: 4 hours of history.

395. Topics in Religious History. 4 Hours. May be repeated for credit. Same as Religious Studies 395. Specific topics are announced each term. Prerequisite: 4 hours of history.

396. Topics in Race, Ethnic, and Minority History. 4 Hours. May be repeated for credit. Same as Black Studies 386. Specific topics are announced each term. Prerequisite: 4 hours of history. Schelbert, Winter.

Courses for Graduate Students

Note: Seminars are generally offered in two-term or three-term sequences. Students may enroll in more than one section.

400. Colloquium for Teachers of History. 1 to 4 Hours. May be repeated for credit. Reading and discussion of significant primary and secondary sources; investigation and development of instructional materials and techniques. Prerequisite: Consent of the instructor.

402. Seminar on Ancient History. 4 Hours. May be repeated for credit for a maximum of 48 hours. Concurrent registration in more than one section is permitted for a maximum of 16 hours per term. Prerequisite: Consent of the instructor.

408. Seminar on Medieval History. 4 Hours. Prerequisite: Consent of the instructor.

410. Seminar on Renaissance History. 4 Hours. Prerequisite: Consent of the instructor.

411. Colloquium on European History. 4 Hours. Reading in topics in European history. Prerequisite: Consent of the instructor.

412. Seminar on European History. 4 Hours. Prerequisite: Consent of the instructor.

421. Colloquium on British History. 4 Hours. Reading in topics in British history. Prerequisite: Consent of the instructor.

422. Seminar on British History. 4 Hours. May be repeated for credit for a maximum of 48 hours. Concurrent registration in more than one section is permitted for a maximum of 16 hours per term. Prerequisite: Consent of the instructor.

431. Colloquium on Russian History. 4 Hours. Reading in topics. Prerequisite: Consent of the instructor.

432. Seminar on Russian History. 4 Hours. Prerequisite: Consent of the instructor.

433. Colloquium on Eastern European History. 4 Hours. Reading in topics. Prerequisite: Consent of the instructor.

441. Colloquium on African History. 4 Hours. May be repeated for credit. Introduction to the literature of African history. Prerequisite: 8 hours of African history.

442. Seminar on African History. 4 Hours. May be repeated for credit. Prerequisite: Consent of the instructor.

451. Colloquium on American History. 4 Hours. Reading in topics. Prerequisite: Consent of the instructor.

452. Seminar on American History. 4 Hours. May be repeated for credit for a maximum of 48 hours. Concurrent registration in more than one section is permitted for a maximum of 16 hours per term. Prerequisite: Consent of the instructor.

462. **Seminar on Latin American History. 4 Hours.** Prerequisite: Consent of the instructor.
471. **Colloquium on Far Eastern History. 4 Hours.** Reading in topics. Prerequisite: Consent of the instructor.
479. **Seminar: Theoretical, Historical, and Philosophical Issues in Psychology. 2 Hours.** May be repeated. Same as Philosophy 479 and Psychology 479. Systematic review of special topics; emphasis on current approaches and interpretations. Prerequisite: Consent of the instructor.
481. **Colloquium on Social History. 4 Hours.** Reading in topics. Prerequisite: Consent of the instructor.
482. **Colloquium on Migration History. 4 Hours.** Reading in topics. Prerequisite: Consent of the instructor.
489. **Seminar on Urban History. 4 Hours.** Prerequisite: Consent of the instructor.
491. **Colloquium on Constitutional History. 4 Hours.** Reading in topics. Prerequisite: Consent of the instructor.
492. **Historiography. 4 Hours.** Great historians from early times to the present. Prerequisite: Consent of the instructor.
493. **Historical Methods. 4 Hours.** A laboratory course that provides an understanding of the study of history and practical application of the methods by which the past is reconstructed. Prerequisite: Consent of the instructor.
497. **Research and Writing. 0 to 12 Hours.** Special problems in research and individual guidance in the preparation of master's research essays. Prerequisite: Consent of the instructor.
498. **Independent Study. 0 to 12 Hours.** Prerequisite: Consent of the instructor.
499. **Thesis Research. 0 to 16 Hours.** May be repeated for credit. Prerequisite: Consent of the instructor.



INFORMATION ENGINEERING

Bruce H. McCormick, Head of the Department
Piergiorgio L.E. Uslenghi, Director of Graduate Studies

Professors: Wolfgang-Martin Boerner, Shi-Kuo Chang, Giorgio Franceschetti (Adjunct), Earl E. Gose, Lawrence W. Kessler (Adjunct), Bruce H. McCormick, Tadao Murata, Philip Parzen, Chathilingath K. Sanathanan, Piergiorgio L.E. Uslenghi, Bert L. Zuber

Associate Professors: Roger C. Conant, Thomas A. DeFanti, Sharad R. Laxpati, Chu-Quon Lee, Glenn K. Manacher, Roland Priemer, Clement T. Yu

Assistant Professors: Brian Phillips, Mark T. Ratajack, Steven A. Vere

The department offers a program leading to the Master of Science in Information Engineering and, jointly with the Departments of Energy Engineering and Materials Engineering, a program leading to the Doctor of Philosophy in Engineering

The master's program is offered for graduates of information engineering-oriented curricula at the University of Illinois at Chicago Circle and for graduates of computer science, communication engineering, electrical engineering, and other similar curricula elsewhere. Graduates of other scientifically oriented curricula may be admitted if they have the background to profit from graduate work in this field. The program is designed to provide students with a broad background in computer, electrical, and information engineering and in the modeling and simulation of large-scale systems. Through formal course work and thesis research, students have the opportunity to specialize in such areas as computer architecture, information networks, software design, artificial intelligence, control systems, dynamic modeling and simulation, ecological systems, analog and digital communications, modern electromagnetics and optics, networks, and solid state electronics.

The doctoral program invites applications from superior students holding the Master of Science in Information Engineering from the University of Illinois at Chicago Circle or an equivalent degree from other accredited institutions. Students are encouraged to follow interdisciplinary programs that include more than one area of specialization and that may require taking courses in more than one department. The program includes several areas of specialization. Among these, the Department of Information Engineering offers study and research in computer science and engineering, electrical science and engineering, information systems, and large-scale systems.

Admission Requirements

Applicants are considered on an individual basis. For admission to regular status, they must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. They must also submit complete transcripts from all colleges and universities attended. In exceptional cases, students who have averages of less than 4.00 but above 3.75 or practicing engineers who wish to return to school for further graduate study may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Depending on their qualifications and background, such students may be admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status.

Applicants for admission to nondegree status must submit all transcripts if they have attended a college or university

within the last five years; otherwise, they only need to show evidence of receipt of a baccalaureate.

Degree Requirements

A grade point average of at least 4.00 is required. Credit toward a graduate degree is not given for any course in which a grade of less than C has been earned.

Master of Science

The minimum requirements are:

1. A minimum of 48 quarter hours of course work with a minimum of 24 quarter hours in information engineering courses.

2. At least three information engineering courses (12 quarter hours) at the 400 level, excluding InfE 491, InfE 495, and InfE 499, chosen among at least two areas of specialization. (For a list of these areas and associated courses, the student should consult the director of graduate studies.)

3. Two additional information engineering courses (8 quarter hours) at the 400 level, including InfE 491, InfE 495, and InfE 499.

4. Completion of either Option 1 or Option 2.

Option 1—The student completes a thesis containing original research and defends it before an examining committee appointed by the Dean of the Graduate College. The student receives credit for at least 8 but not more than 16 quarter hours of InfE 499—Thesis Research.

Option 2—The student completes a written report on a research, design, or reading project that must be approved at an oral examination administered by a committee appointed by the director of graduate studies. The student receives credit for at least 4 but not more than 12 quarter hours of InfE 495—Individual Research. This option is primarily intended for those students who will not continue their studies beyond the MS.

Doctor of Philosophy

Individuals with superior credentials and demonstrated research ability are invited to take the qualifying examination. Upon successful completion of the examination and completion of the MS, the student is admitted to the program leading to the degree of Doctor of Philosophy in Engineering.

A minimum of 96 quarter hours of course work beyond the baccalaureate is required. Toward the end of course work and after having clearly identified a thesis topic, the candidate must pass an oral preliminary examination administered by a faculty committee. The 96 quarter hours and the preliminary examination must be completed within four calendar years of passing the qualifying examination. Specific requirements on distribution of courses, qualifying examination, etc., are listed in a brochure available from the director of graduate studies.

The candidate must earn an additional 48 quarter hours in Information Engineering 499—Thesis Research after completion of the MS.

A major requirement of the doctoral program is the completion of a thesis based on original research carried out under the supervision of a faculty committee consisting of at least five members, of whom at least three shall be from within and one from without the Department of Information Engineering. The candidate must defend the dissertation before the thesis committee in a public examination.

Proficiency in a foreign language is not required.

Courses for Graduate and Advanced Undergraduate Students

300. Design Automation. 3 Hours. Concepts of systems that utilize computer techniques in support of the design and development of

technologically oriented products. Engineer/computer interaction, requirements for design-oriented data base construction, simulation, testing, and automated repair fundamentals. Applications to electronic digital systems. Prerequisites: InfE 271 and either InfE 371 or consent of the instructor. Fall.

302. File and Communication Systems. 4 Hours. Same as Systems Engineering 302. Functions. File system hardware and organization and structure. Analysis of file systems. Data management systems. Communication system hardware and organization and structure. Analysis of communication systems. Examples of integrated systems. Practical laboratory experience. Prerequisite: InfE 270. Fall, Spring.

306. Natural Language Processing. 4 Hours. Same as Linguistics 306. Automatic analysis of natural language. Adequacy of natural language models. Comparison of natural language with programming languages. Evaluation of language processing systems. Parsing. Machine understanding of language. Question-answering. Machine translation. Prerequisite: InfE 375. Fall.

307. Pattern Recognition I. 4 Hours. Same as Bioengineering 307 and Systems Engineering 307. The design of automated classification systems. Decision theory. Parametric and nonparametric procedures for the classification of patterned data sets. Clustering and unsupervised learning. Prerequisite: Math 370 or SysE 342 and InfE 270. Fall.

311. Linear Systems Analysis. 4 Hours. Application of Laplace transform and state variable techniques to the analysis of linear systems. Introduction to discrete time systems. Transform methods, natural response, and stability. Transform functions, block diagrams, and signal flow graphs. Applications to electrical networks. Amplifier circuits, servo devices, continuous and discrete time filters. Prerequisites: InfE 210, Math 220, and credit or registration in Math 195. Winter, Spring.

312. Introduction to Communication Engineering. 4 Hours. Introduction to communication systems; amplitude, frequency, and pulse-type modulation, time and frequency multiplexing, noise calculations and signal to noise ratio. Prerequisites: InfE 212, 240, and concurrent registration in InfE 340. Winter, Spring.

315. Network Analysis. 4 Hours. Classification of networks and network elements. Matrix algebra for network analysis. Introductory network topology. Matrix loop, node, and state variable equations. Network functions and theorems. Topics in computer-aided network analysis. Prerequisite: InfE 311. Fall.

316. Introduction to Network Synthesis. 4 Hours. Topics in one- and two-ports LC, RC, RL, and RLC network synthesis. Network approximations, such as Butterworth and Chebyshev methods. Frequency transformations. Introduction to active RC filter design using devices such as operational amplifiers. Individual projects are required. Prerequisite: InfE 311. Winter.

320. Transmission Lines. 4 Hours. No graduate credit for information engineering majors. Transmission line equations. Transient phenomena. Time-harmonic waves. Impedance charts. Microstrip transmission lines. Three-phase systems. Practical laboratory experience. Prerequisite: InfE 240. Fall, Winter.

321. Electromagnetic Fields. 4 Hours. No graduate credit for information engineering majors. Vector calculus. Maxwell's equations, Potentials. Wave propagation. Energy theorems. Reflection and refraction of plane waves. Introduction to radiation. Prerequisites: InfE 212, Math 220. Winter, Spring.

324. Principles of Microwaves. 4 Hours. Analysis of guided waves. Rectangular and circular cylindrical waveguides. Coaxial lines. Dielectric rod microwave devices. Microwave network theory. Practical laboratory experience. Prerequisites: InfE 320, 321. Winter.

325. Antenna Engineering and Wave Propagation. 4 Hours. Radiation from current elements. Scalar and vector formulation for radiation and scattering. Theorems of antenna analysis. Antenna impedance. Prerequisite: InfE 321. Fall.

326. Microwave Semiconductor Electronics. 4 Hours. Varactor diodes, parametric devices, and harmonic generators. Tunnel, IMPATT, and Gunn diodes, with applications. Prerequisites: InfE 321, 346. Spring.

327. Modern Linear Optics. 4 Hours. Two-dimensional Fourier analysis, linear invariant systems, sampling theory. Applications of transfer functions to scalar diffraction, gratings, and lenses. Frequency analysis of imaging systems. Spatial filtering and optical information processing. Holography and its applications. Practical laboratory experience. Prerequisites: InfE 321. Winter.

330. Communication Theory I. 4 Hours. With Information Engineering 331, an introduction to statistical communication theory. Signal spectra, modulation, noise, probability theory; applications of statistics to communication systems. Prerequisite: InfE 312. Fall.

331. Communication Theory II. 4 Hours. Continues Information Engineering 330. Individual projects are required. Prerequisite: InfE 330. Winter.

332. Computer Communications. 4 Hours. Common-carrier data communication. Asynchronous time division multiplexing. Interfacing and data concentration. Multiple access communication. System design of computer networks. Optimum file allocation. Scheduling. Queuing and delays. Specific systems. Prerequisite: InfE 312. Spring.

340. Electronic Circuits. 4 Hours. Analysis and design of analog and digital electronic circuits; basic circuit properties, linear amplifiers, stability, operational and multistage configurations, tuned amplifiers and oscillators. Practical laboratory experience. Prerequisite: InfE 212, 240, Math 195. Fall, Spring.

344. Electronic Switching, Timing, and Pulse Circuits. 4 Hours. Analysis of piecewise linear active networks; single time constant circuit evaluation; semiconductor devices as switching elements; clamping, coupling, regenerative switching, and linear sweep circuits; pulse transformers; negative-resistance devices. Practical laboratory experience. Prerequisites: InfE 212, 340. Winter.

345. Integrated Circuit Applications and Systems. 4 Hours. Components in integrated circuits; digital integrated circuit families; linear wideband, differential, operational, and power amplifiers; operational amplifier design, analysis, and switching circuit applications; communication and data conversion circuits; digital information storage. Practical laboratory experience. Prerequisite: InfE 344. Spring.

346. Semiconductor Electronics. 4 Hours. Electron and hole transport mechanisms in semiconductor devices; quantum approach to distributions and statistics, recombination and generation, p-n junctions, and transistors; practical laboratory experience. Prerequisites: InfE 240 and credit or registration in Phys 244. Fall, Spring.

347. Thin-Film Devices. 4 Hours. Introduction to vacuum technology. Methods of fabrication of films; sputtering, evaporation, electron beam evaporation, and chemical deposition. Physical properties of films. Application of such films as resistor, capacitor, transistor, diode, magnetic memory devices, and superconductors. Prerequisites: InfE 340, 346. Winter.

348. Field Effect Devices. 4 Hours. Electronic processes in surface-controlled semiconductor and dielectric devices. Properties of MIS field effect capacitors and transistors, surface and interface effects, and fabrication techniques. Prerequisites: MatE 230, InfE 340, 346. Spring.

352. Biocontrol. 3 Hours. Same as Bioengineering 352. Applicability of control systems theory to physiological systems, including the pupil system and eye and hand movement systems, utilizing such techniques as Fourier analysis, Nyquist stability criteria, and cross-correlation. Prerequisites: InfE 311 and BioS 363 or 364. Spring.

353. Biocontrol Laboratory. 3 Hours. Same as Bioengineering 353. Experimental counterpart of Information Engineering 352. Motor coordination, crayfish photoreceptor, human pupil, eye movement. Prerequisite: Credit or registration in InfE 352. Spring.

354. Bioinstrumentation: Transducers. 4 Hours. Same as Bioengineering 354. Energy conversion; detailed discussion of transducers used in biological research. Prerequisites: BioE 200, InfE 240, 311. Winter.

359. Mammalian Neuroanatomy. 6 Hours. Same as Bioengineering 359 and Biological Sciences 359. Introduction to the neurological organization of the mammalian central nervous system. Prerequisites: BioS 280 or 281 or consent of the instructor.

360. Automatic Control I. 4 Hours. Mathematical models of typical electrical mechanical and hydraulic control systems; block diagram representation; system function state variable representation. Concept of feedback and stability. Time domain analysis using PID controllers. Root locus techniques for design and for performance improvement. Laboratory assignments include CSMP simulation techniques for analysis and design using a digital computer. Prerequisite: InfE 311 or SysE 315. Fall.

361. Automatic Control II. 4 Hours. Requirements for incorpo-

rating mini-/microcomputers in closed loop control. Analog-digital and digital-analog signal conversion and signal conversion and signal conditioning. Principles of sampled data control. Theory of compensation. Design of digital compensators. Reliability and dynamic stability of digital control. Case studies. Process control and industrial automation. Laboratory demonstration. Prerequisite: InfE 360. Winter.

370. Computer Systems. 4 Hours. Multiprogramming, time-sharing and real-time computer systems. Process management, memory management, data management. Software modules. Input/output control software. General resource management. Deadlock resolution. Design and implementation at a simple operating system. Practical laboratory experience. Prerequisite: InfE 270.

371. Switching Networks and Logical Design. 4 Hours. Basic concepts common to digital systems. Coding and representation of information, nondecimal number systems, switching algebra, combinational logic, electronic implementation and representation of logic, minimization techniques, analysis and synthesis of asynchronous and synchronous sequential networks, error-correcting codes, hazards and races due to logical circuit delays. Prerequisite: InfE 271. Fall.

372. Advanced Digital Systems. 4 Hours. Digital system design on the register transfer level. Design description and verification using hardware. Description language translator and simulator. Introduction to minicomputer, microcomputer, and microprocessor architectures. Discussions of storage devices, peripheral devices, interface design, microprogramming, microoperations, and control sequence by means of a hardware description language. Prerequisite: InfE 271. Fall, Spring.

373. Data Base Systems. 4 Hours. An integrated approach to the design of information systems; structural elements, design guidelines, and accessing techniques. Survey of hierarchical data base, plex-structured data base, relational data bases and their implementation. Data base integrity and security. User interface design. Approaches to information systems, knowledge systems design, and evaluation. Prerequisite: InfE 302.

374. Software Design. 4 Hours. Principles of software engineering. Design methodology for software systems. Structured programming and software blueprints. Run-time structures in programming languages. Communication, linking, and sharing of programs and data. Program documentation, debugging, and testing. Prerequisite: InfE 370. Winter.

375. Artificial Intelligence I. 4 Hours. Introduction. Review of heuristic problem-solving in game-playing, theorem-proving, language understanding, computer vision. Problem representation; predicate calculus problem-solving methods; heuristic search techniques. Individual projects are required. Prerequisites: InfE 270. Fall, Winter.

376. Artificial Intelligence II. 4 Hours. Semantic information processing. Procedural representation of knowledge. Computer representation of meaning and common sense. Current topics. Individual projects are required. Prerequisite: InfE 375. Spring.

377. Computer Vision I. 4 Hours. Principles of interacting image processing by computer. Electro-optical array sensors. Image coding and bandwidth compression techniques. Scene segmentation strategies for two-dimensional images. Analysis of polyhedral scenes in three dimensions. Link to computer graphics. Practical laboratory experience. Prerequisites: InfE 270, 311. Winter.

378. Computer Graphics I. 4 Hours. Same as Systems Engineering 378. Principles of interactive computer graphics. Discussion of display devices, display files, and interactive graphical techniques. Treatment of graphical structures in two dimensions. Practical laboratory experience. Prerequisites: InfE 270, 272. Spring.

379. Real-Time Data Processing. 4 Hours. Same as Bioengineering 379. Techniques for acquisition and digital representation of data obtained from analog and digital devices. Methods for digital signal processing. Data reconstruction and display. Applications such as medical data acquisition and analysis and closed-loop sampled data control. Implementation of techniques on a real-time dedicated mini- and microcomputer. Individual projects are required. Prerequisites: Math 195, InfE 311 or the equivalents.

380. Physiological Applications of Real-Time Data Processing. 3 Hours. Same as Bioengineering 380. Application of on-line real-time data processing techniques to problems in physiological experimentation, patient monitoring systems, and problems associ-

ated with biological data. Projects include the acquisition and processing of biological data on a small dedicated laboratory computer. Prerequisite: Credit or registration in BioE 379 or InfE 379.

391. **Seminar. 1 to 4 Hours.** May be repeated for credit. Topics of mutual interest to a faculty member and a group of students. Offered as announced by department bulletin or the Timetable. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

393. **Special Problems. 2 to 4 Hours.** May be repeated for credit. Special problems or reading by arrangement with the faculty. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

396. **Senior Design I. 4 Hours.** Introduction to engineering economics, legal and social constraints on design, safety and reliability theory, and the use of simulation and optimization techniques in the engineering design process. Prerequisites: Senior standing and completion of all core requirements in the College of Engineering. Staff, Fall, Winter.

397. **Senior Design II. 4 Hours.** Application of principles of engineering and engineering design methodology to the solution of a design problem. Prerequisite: InfE 396. Staff, Winter, Spring.

Courses for Graduate Students

405. **Computer Instructional Systems. 4 Hours.** Same as Doctor of Arts 405. Design structures, computer-assisted instruction; computer-managed instruction; PLATO, TICCIT, and other experimental systems with respect to author languages, use of graphics, systems resources, distribution, and cost factors. Prerequisite: Graduate standing.

407. **Pattern Recognition II. 4 Hours.** Same as Bioengineering 407. Computer-based methodology for the organization and representation of knowledge. Knowledge-based pattern recognition. Inference of pattern descriptions. Applications to clinical decision support, processing of natural language, and robotics. Prerequisite: InfE 307.

408. **Cybernetics II. 4 Hours.** Comparison of natural and artificial intelligence and pattern recognition. Information processing in nets. Image processing. Models of retinal and brain structure, thought, learning, and memory. Prerequisite: InfE 307.

409. **Pattern Recognition III. 4 Hours.** Same as Bioengineering 409. Advanced pattern recognition techniques and applications. Projects. Review of current literature. Prerequisite: InfE 307.

410. **Advanced Linear Analysis. 4 Hours.** Analysis of linear networks and systems in the time and frequency domains. Basis of loop and node equations. Signal flow graphs, transform methods, state variable representation, stability. Prerequisites: InfE 311 and credit or registration in Math 330. Fall.

413. **Active Network Synthesis. 4 Hours.** Linear active and non-reciprocal network synthesis. Realizations involving negative resistances, controlled sources, negative immittance convertors, gyrators, and operational amplifiers. Sensitivity considerations. Application to active integrated circuit synthesis. Prerequisite: InfE 316.

414. **Advanced Topics in Networks. 4 Hours.** Selection of topical subjects from information processing networks, Petri nets and their applications, large-scale networks, discrete optimizations in networks, computer-aided network design, and nonlinear networks. Prerequisite: InfE 415.

415. **Applied Graph Theory. 4 Hours.** Tree, path, circuit, cutset, and their matrices. Isomorphic, planar, and dual graphs. Vector spaces and matrices of a graph. Coverings, matchings, and bipartite graphs. Applications to switching and communication networks and to areas in computer science. Topological solution of linear equations. Prerequisite: InfE 315 or Math 348.

416. **Digital Filter Synthesis and Signal Processing. 4 Hours.** Sampling theorem; z-transform theory; time and frequency domain characterization of digital filters; digital filter synthesis techniques; the DFT and FFT with applications; digital filter realization error analysis. Individual projects. Prerequisite: InfE 311 or SysE 315 or the equivalent. Fall.

420. **Electromagnetic Field Theory. 4 Hours.** Maxwell's equations and special relativity. Charged particles dynamics. General theories for interior and exterior boundary-value problems. Propagation in various media. Prerequisites: InfE 324 or 325; credit or registration in Math 330. Fall.

421. **Computational Electromagnetics. 4 Hours.** Finite-element

solution of Poisson's and Helmholtz's equations. Computer solutions of integral equations of antennas and scattering theory; method of moments, fast Fourier transform method. Time-domain analysis; singularity expansion method, short pulse response. Emphasis on practical problems in radiation and scattering. Prerequisite: InfE 420 or the equivalent.

422. **Advanced Microwave Theory. 4 Hours.** Microwave integrated circuits. Microwave devices, cavities, and filters. Solid state traveling-wave amplifiers and oscillators. Prerequisites: InfE 324, 326 or the equivalents. Spring.

423. **Antenna Theory and Design. 4 Hours.** Antenna parameters. Analysis of linear and loop antennas. Uniform and nonuniform arrays. Slot, horn, conical, and spherical radiators. Reflector, traveling wave, broadband and lens antennas. Antenna pattern synthesis. Prerequisites: InfE 325, 420. Winter.

427. **Optical Electronics. 4 Hours.** Waves, rays, and gaussian beams in various media. Optical resonators. Interaction of radiation and atomic systems. Theory of laser oscillation. Solid, gas, and semiconductor lasers. Nonlinear optical phenomena. Optical radiation: modulation, detection, and noise. Optical communication systems. Prerequisites: InfE 327, 420 or the equivalents.

428. **Integrated Optics. 4 Hours.** Fabrication techniques and optical properties of thin solid films. Thin-film optical waveguides; methods of mode launching; radiation losses due to bends and surface irregularities. Integrated optics lasers. Modulators and deflectors. Parametric thin-film optical devices. Prerequisite: InfE 420 or the equivalent.

430. **Advanced Communication Theory I. 4 Hours.** Beginning graduate course in modern communication theory. Review of probability theory, random waveforms, optimum receiver principle. Prerequisite: InfE 331. Winter.

431. **Advanced Communication Theory II. 4 Hours.** Continues Information Engineering 430. Efficient signaling for message sequences and implementation of coded systems. Prerequisite: InfE 430. Spring.

438. **Information Flow in Systems. 4 Hours.** Elements of Shannon's information theory. Generalization to N dimensions. Use for detecting and measuring constraints in systems. Relation between information and control. Implications of information theory for system architecture. Laws of information flow in systems. Non-probabilistic information theory. Prerequisite: InfE 410.

439. **Seminar on Behavior and Information Theory. 3 Hours.** Topics in the application of information theory to behavior; emphasis on infra-human behavior. Prerequisite: Math 370 or InfE 408 or Psch 470.

440. **Solid State Device Theory I. 4 Hours.** Electrical phenomena in solids, using quantum mechanics. Semiconductors, p-n junctions, transistors. Hall effect, thermal and optical effects. Prerequisites: InfE 342, Phys 321. Fall.

441. **Integrated Solid State Devices. 4 Hours.** Applications of solid state theory to modern integrated circuits. Active and passive semiconductors, active and passive functional blocks, MOS and thin-film devices. Prerequisites: InfE 316, 440. Winter.

442. **Solid State Device Theory II. 4 Hours.** Tunnel, Gunn, and IMPATT diodes, insulator diodes, carrier traveling wave effects in semiconductors. Prerequisites: InfE 440 and credit or registration in InfE 420. Winter.

451. **Advanced Biocontrol. 4 Hours.** Same as Bioengineering 451. Mathematical modeling and analysis of biological systems, emphasizing techniques of control engineering. Laboratory experiments on control systems of pupil eye movement and sensory motor coordination. Prerequisite: InfE 353.

453. **Advanced Systems Physiology. 4 Hours.** Same as Bioengineering 453. Intensive treatment of selected neurophysiological topics; emphasis on systems organization. Prerequisite: InfE 353.

457. **Analysis of Visual Systems. 4 Hours.** Same as Bioengineering 457. An advanced course covering in detail important research areas of the visual system. The fundamental importance of physical, chemical, and physiological processes as related to vision is stressed. Prerequisites: InfE 453 and consent of the instructor.

460. **Advanced Control Theory. 4 Hours.** Analysis of multivariable, multiloop control systems. Advanced topics in state space, time-varying and distributed parameter systems, stability, controllability, and observability. Introduction to adaptive control. Various computer applications. Prerequisite: InfE 361. Winter.

461. Nonlinear Control. 4 Hours. Classification of nonlinear phenomena, linear and piecewise linear approximations. The describing function and on-off servomechanisms, phase plane techniques, limit cycle, stability concepts. Use of analog, digital, and hybrid computers for simulation. Prerequisite: InfE 361.

470. Automata Theory. 4 Hours. Definition and representation, equivalent states, congruence relations, decision problems of finite automata, the halting problem, state assignment problem, partitions, growing automata, probabilistic automata, self-repairing and self-reproducing systems. Prerequisite: InfE 370. Fall.

471. Advanced Switching Theory. 4 Hours. Principles of sequential circuit synthesis, structure of combinational switching circuits, the covering problem, multiple output and multilevel combinational circuits, bilateral switching networks, speed independent switching circuit theory. Prerequisite: InfE 371. Winter.

472. Hybrid Computation Theory and Techniques. 4 Hours. Basic characteristics of analog and digital computers, nature of problems best suited for these computers, organization of a hybrid computer, analog digital conversion, hybrid computing techniques with examples from different disciplines. Prerequisite: InfE 370.

477. Computer Vision II. 4 Hours. Analysis of complex natural sciences: texture analysis and synthesis; picture segmentation by region analysis; knowledge-based automatic scene interpretation. Applications to biomedical image processing, remote sensing of the environment, and robotics. Prerequisites: InfE 375, 377. Spring.

478. Computer Graphics II. 4 Hours. Three-dimensional computer graphics, including spatial transformations, perspective, hidden line elimination, and shading. Representation of curved surfaces. Command languages, programming languages, and other elements of graphics system design. Prerequisites: InfE 378 and either 374 or consent of the instructor. Spring.

484. Bioinstrumentation: Systems. 3 Hours. Same as Bioengineering 484. Analysis of systems used in biological and medical instrumentation. General principles and specific electrical, mechanical, and optical aspects of instrumentation systems.

491. Seminar. 1 to 4 Hours. Topics to be arranged. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

495. Individual Research. 2 to 4 Hours. May be repeated. Research on special problems not included in graduate thesis. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Thesis work under the supervision of a graduate adviser. Staff, Fall, Winter, Spring.

LINGUISTICS

Andrew Schiller, Head of the Department
Dale E. Woolley, Director of Graduate Studies

Professors: Falk S. Johnson, Adam Makkai, Andrew Schiller

Associate Professors: Valerie B. Makkai, Dale E. Woolley

Assistant Professors: Kyoko Inoue, John S. Rohsenow

Lecturers: Thomas Rohlick

The Department of Linguistics offers work leading to the Master of Arts in theoretical linguistics, which prepares students for admission to programs offering advanced professional training at the doctoral level, and applied linguistics, including a Teachers of English to Speakers of Other Languages (TESOL) specialization, which prepares students for careers as language teachers.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. In exceptional cases, students who have averages of less than 4.00 but above 3.75 may be admitted if they can show evidence of substantial promise of ability to complete the program successfully.

In addition to the minimum transcript requirements established by the Graduate College (p. 31), applicants must submit directly to the Department of Linguistics the following:

1. Three letters of recommendation, preferably from professors who are familiar with the applicant's recent work.
2. A statement of about 250 words presenting the applicant's reasons for wishing to do graduate work in linguistics and the relationship of such work to such professional and other goals.

A foreign applicant is also required to submit a four- to five-page summary of educational experience, emphasizing work in English and other literatures and languages and concluding with a statement of reasons for wanting to do graduate work in the United States. This replaces the 250-word statement required of other applicants.

The department will accept a limited number of students on nondegree status. Applicants must submit a transcript from the institution that awarded the baccalaureate to the applicant.

Degree Requirements

Independent Study. Some of the degree requirements may be met through independent study courses. They are primarily intended for advanced graduate students and serve needs that cannot be met by existing courses, colloquia, or seminars. A student should make arrangements for an independent study course well in advance of the beginning of the term. A written plan of work at the beginning of study and a final written report at its conclusion are required and become part of the student's permanent department records. Normally, no more than one-fourth of the total hours required for the degree should be in independent study. (This does not apply to thesis research.)

**Master of Arts in Theoretical Linguistics
or Applied Linguistics**

Hours. A minimum of 48 quarter hours of course work is

required, including Linguistics 305—Introduction to Linguistics and Linguistics 309—Introduction to Bibliography and Research. At least 24 quarter hours of course work must be in linguistics. At least 16 quarter hours must be in 400-level linguistics courses, of which at least 8 hours must be in regularly scheduled courses.

Language. The student must pass a reading examination in either one or two foreign languages, which may be other than classical and modern European. One foreign language is required for the degree in applied linguistics, two foreign languages for the degree in theoretical linguistics.

Thesis. The student is required to submit a thesis and may register for up to 12 hours of thesis research.

Examination. The student must pass a comprehensive examination.

Master of Arts in Applied Linguistics with Specialization in TESOL

The requirements for the MA in applied linguistics apply, but with these differences:

1. The following three courses must be included in the 48 quarter hours required for the degree:

Linguistics 342—Contrastive Language Studies

Linguistics 383—Teaching English as a Second Language

Linguistics 454—Linguistics and Language Learning

2. In place of the thesis, the student must register for up to 12 hours in Linguistics 498—Internship in TESOL. The arrangements for the internship are made by the Department of Linguistics.

Courses for Graduate and Advanced Undergraduate Students

305. Introduction to Linguistics. 4 Hours. Introduction to the theories and methods of the phonological, morphological, and syntactic analysis of language. Prerequisite: Junior standing.

306. Natural Language Processing. 4 Hours. Same as Information Engineering 306. Automatic analysis of natural language. The adequacy of natural language models. Comparison of natural language with programming languages. Evaluation of language processing systems. Parsing. Machine understanding of language. Question-answering. Machine translation. Prerequisite: InFE 375.

307. History of Linguistic Science. 4 Hours. Development of linguistic thought from its historical beginnings to the present. Prerequisite: Ling 305 or junior standing and consent of the instructor.

309. Introduction to Bibliography and Research. 4 Hours. Required for graduate students in linguistics. Detailed study of bibliographical tools in the various fields of linguistics. Prerequisite: Junior standing.

310. Phonology. 4 Hours. Introduction to the theories and methods of phonological analysis. Prerequisite: Ling 305 or junior standing and consent of the instructor.

312. Linguistic Phonetics. 4 Hours. Same as Communication and Theater 308. The relationship of articulatory, acoustic, and auditory phonetics to the study of language. Prerequisite: Ling 310, or junior standing and consent of the instructor.

314. Experimental Phonetics. 4 Hours. Same as Communication and Theater 309. Contributions of instrumental techniques and experimental design to the study of phonetics. Prerequisite: Ling 310, or junior standing and consent of the instructor.

320. Morphology. 4 Hours. Introduction to the theories and methods of morphological analysis. Prerequisite: Ling 310 or junior standing and consent of the instructor.

330. Syntax. 4 Hours. Introduction to the theories and methods of syntactic analysis. Prerequisite: Ling 320 or junior standing and consent of the instructor.

340. Comparative and Historical Linguistics. 4 Hours. The comparative and diachronic study of languages. Prerequisite: Ling 310 or junior standing and consent of the instructor.

342. Contrastive Language Studies. 4 Hours. The theory and practice of contrastive descriptions of languages, exemplified by contrastive studies of English with various other languages, especially Spanish. Prerequisite: Ling 305.

352. Applied Linguistics. 4 Hours. May be repeated for a maximum of 12 hours of credit. Study of a selected topic, such as the problems of literary style, rhetoric, metrics, or the construction of pedagogical grammars. Content varies. Prerequisite: Ling 305 or junior standing and consent of the instructor.

353. Dialectology. 4 Hours. Geographical and social variations in languages. Prerequisite: Ling 310 or junior standing and consent of the instructor.

356. Field Methods in Linguistics. 4 Hours. The description of a language using data supplied by native speakers. Prerequisite: Ling 310 or junior standing and consent of the instructor.

357. Systemic and Functional Description of Modern English I. 4 Hours. An introductory scientific description; emphasis on surface structure. Prerequisite: Ling 305.

358. Systemic and Functional Description of Modern English II. 4 Hours. Advanced scientific description; emphasis on meaning and social codes. Prerequisite: Ling 357.

359. Topics in Linguistics. 4 Hours. May be repeated for a maximum of 12 hours. Topics vary. Prerequisite: Consent of the instructor.

360. Proseminar on Linguistics. 4 Hours. May be repeated for a maximum of 12 hours. Seminar reports and papers on a specific topic of discussion for the term. Topics vary. Prerequisites: 12 hours of linguistics and consent of the instructor.

374. The Psychology of Language. 4 Hours. Same as Psychology 354 and Communication and Theater 384. Introductory survey of methods, theory, and research; the history and present status of psychology's interest in language behavior. Prerequisite: Consent of the instructor.

380. Problems in Linguistic Analysis. 4 Hours. Same as Anthropology 380. The methods and techniques used in linguistics, with reference to actual language data; emphasis on anthropological applications. Prerequisite: Anth 280 or Ling 305.

383. Teaching English as a Second Language. 4 Hours. Same as Education 383 and English 383. The methodology of teaching English to residents of the United States who do not speak the language, especially Spanish-Americans. Prerequisite: Engl 300 or 205 or Ling 305.

397. Independent Study. 1 to 4 Hours. May be repeated for a maximum of 8 hours. Students are assigned to this course at the discretion of the department. Independent study in an area of linguistics not normally covered by regular course offerings. Prerequisites: 12 hours of linguistics and approval of the department.

Courses for Graduate Students

445. Introduction to Indo-European Studies. 4 Hours. Prerequisites: A reading knowledge of French or German and consent of the instructor.

453. Language Typology. 4 Hours. Theories and methods of the classification of languages. Prerequisite: Ling 330 or the equivalent.

454. Linguistics and Language Learning. 4 Hours. Applications of linguistic science to the teaching of foreign languages. Prerequisite: Ling 330 or the equivalent.

457. Semantics. 4 Hours. The study of meaning. Prerequisite: Ling 330 or the equivalent.

459. Seminar on Linguistics. 4 Hours. May be repeated for a maximum of 12 hours. Topics vary. Prerequisite: Consent of the instructor.

471. Experimental Psycholinguistics. 4 Hours. Same as Psychology 401 and Communication and Theater 401. Intensive review of experimental laboratory studies concerned with the effects of phonological, syntactic, and semantic variables on sentence perception, comprehension, production, and memory in the mature user of language. The relevance of the research in contemporary psycholinguistic theory is emphasized. Prerequisites: Ling 374 or the equivalent and consent of the instructor.

472. Developmental Psycholinguistics. 4 Hours. Same as Psycholo-

gy 427. Theoretical formulation, research methods, and research findings in the area of language development. Biological foundations and environmental influences; disorders of language development. Prerequisite: Ling 374.

480. **Seminar on Sociolinguistics. 4 Hours.** Same as Anthropology 480. Past and current approaches to sociolinguistics; variations of linguistic structure with social structure among different linguistic groups. Prerequisite: Ling 380.

497. **Independent Study in Linguistics. 2 to 8 Hours.** May be repeated for a maximum of 8 hours. Independent study and research on a topic other than that approved for a graduate thesis. Prerequisite: Consent of the instructor and the head of the department.

498. **Internship in TESOL. 0 to 12 Hours.** Satisfactory/unsatisfactory grade only. Supervised teaching at an assigned TESOL center. Prerequisite: Consent of the head of the department.

499. **Thesis Research. 0 to 16 Hours.** May be repeated for a maximum of 16 hours. Open only to degree candidates. Independent research on a topic approved for a graduate thesis. Prerequisite: Consent of the thesis supervisor and the head of the department.

MATERIALS ENGINEERING

Ernest F. Masur, Head of the Department
Surendra P. Shah, Director of Graduate Studies

Professors: Thomas H. Blewitt, Robert F. Domagala (Adjunct), Jorge O. Galante (Adjunct Research Professor), Dusan Krajcinovic, David W. Levinson, Ernest F. Masur, Paul E. Mast (Adjunct), William Rostoker, Albert B. Schultz, Surendra P. Shah, Marshall L. Silver, Thomas C.T. Ting, Georg E.O. Widera, Chien H. Wu.

Associate Professors: Robert H. Bryant, Donald G. Lemke, Antoine E. Naaman, Daniel F. Schoeberle

Assistant Professors: Ahmed M. Abdel-Ghaffar, Arsavir T. Andonian, Krishna C. Gupta, Michael J. McNallan, Rohan H. Phillips, Robert L. Spilker

The department offers a program leading to the Master of Science in Mechanics and Materials. Jointly with the Departments of Energy Engineering and Information Engineering it offers a program leading to the Doctor of Philosophy in Engineering.

The MS program covers a broad range of topics and may be used either as a terminal program or as a basis for further studies. The courses offered are relevant to many professional disciplines. Because of extensive freedom in course selection, a student may prepare for a career in such diverse areas of concentration as metallurgy, soil mechanics and foundations, structures (including concrete technology), engineering mechanics (including machine mechanics and biomechanics), and environmental mechanics and materials. Interdisciplinary and interdepartmental programs are permitted and encouraged, especially in the biological and environmental disciplines.

The student selects a department adviser with whom a tentative course program is planned. Both program and adviser may be changed at any time to suit the student's needs and preferences; however, satisfaction of the department degree requirements must be verified by the department.

To aid the student in planning an initial program, the following courses offered by the Department of Materials Engineering are listed according to this disciplinary relevance. For possible program and course combinations and for information on new course offerings the special department brochures and bulletins should be consulted.

Metallurgy—Materials Engineering 331, 332, 333, 334, 335, 337, 338, 360, 361, 362, 363, 364, 384, 432, 433, 434, 361, 462, 463, 465, 466, 467

Geotechnical Engineering and Geosciences—Materials Engineering 344, 345, 346, 370, 371, 372, 373, 434, 441, 442, 447, and courses in geological sciences

Structures—Materials Engineering 302, 321, 322, 323, 324, 325, 326, 327, 328, 340, 402, 406, 411, 421, 422, 423, 424, 425, 426, 427, 429

Mechanics —Materials Engineering 302, 303, 304, 308, 309, 311, 312, 313, 316, 333, 360, 361, 383, 402, 403, 404, 406, 408, 409, 411, 412, 413, 414, 415, 416, 419, 420, 433, 461, 462, 463

Environmental Mechanics and Materials—Materials Engineering 302, 304, 308, 311, 312, 313, 321, 322, 333, 334, 338, 370, 381, 383, 411, 412, 413, 421, 425, 463

In the environmental mechanics and materials areas students are expected to supplement their program with relevant course offerings in the Departments of Energy Engineering and Systems Engineering and in the School of Public Health of the University of Illinois at the Medical Center.

The joint PhD program includes several areas of specialization, of which the Department of Materials Engineering covers the fields of continuum mechanics, metallurgy, geotechnical engineering, and structures. Students are permitted and encouraged to follow interdisciplinary programs that include more than one area of specialization and may require taking courses in more than one department.

The Department of Materials Engineering in cooperation with the Department of Geological Sciences also offers a coordinated program of study for students interested in geotechnical engineering and geosciences. This program, leading to the Doctor of Philosophy in Engineering, will enable the student with interests in soil engineering, rock mechanics, engineering geology, hydrology, environmental geology, geophysics, and other areas of the geosciences to obtain an advanced degree.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate in engineering or a related field from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. In exceptional cases, students with averages of less than 4.00 but above 3.75 or practicing engineers and geoscientists who wish to return to school for graduate instruction may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Depending on their qualifications and background, such students may be admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status. Complete transcripts for all undergraduate (and any graduate) work must be submitted.

The department will consider applications for nondegree admission from applicants who meet minimal Graduate College criteria (p. 29).

Degree Requirements

A grade point average of at least 4.00 is required. Credit toward a graduate degree is not given for any course in which a grade of less than C has been obtained.

Master of Science

Of the required 48 quarter hours, at least 16 must be in 400-level courses and at least 8 must be in regularly scheduled 400-level courses in the department (not including 499). Be-

cause of the diversity of the department offerings and areas of specialization, specific courses are not prescribed; however, to insure adequate breadth, the student must complete at least two courses outside the immediate area of specialization.

A thesis is not mandatory for students specializing in areas other than metallurgy. Metallurgy students are ordinarily required to write a thesis; however, exceptions may be made, provided the student demonstrates substantial professional experience, as well as upon approval by the department Graduate Committee of a petition for thesis waiver. Thesis students must enroll in Materials Engineering 499—Thesis Research up to a maximum of 12 quarter hours. Only 8 of these hours may be used to satisfy the 400-level course requirement. The student must defend the thesis before an examining committee appointed by the Dean of the Graduate College.

Doctor of Philosophy

To become a candidate for the doctorate, a student must pass a qualifying examination to be taken within one term of the completion of the requirements for an MS. A student who has an MS from another institution or department must take the qualifying examination within two terms of admission as a graduate student. It may be retaken once if so recommended by the examination committee.

Approximately 48 quarter hours of course work beyond the MS (or the equivalent) are required. A student must take at least 4 regularly scheduled 400-level courses in the department (not including 499). Toward the end of the course work, the student is required to pass a preliminary examination administered by a faculty committee.

A major requirement of the PhD program is the completion of a thesis based on original research, which is carried out under the supervision of a faculty committee. The thesis must be defended before the committee and the public in an examination, notice of which appears in an official campus publication.

Foreign language proficiency is not required.

Courses for Graduate and Advanced Undergraduate Students

302. Applied Elasticity I. 4 Hours. Variational theorems of elasticity theory. Application to establishment and solution of approximate systems; beams (including shear deformation) and plates. Introduction to instability theory. Prerequisite: MatE 205 or 206. Widera, Fall.

303. Theory of Elasticity I. 4 Hours. The boundary value problems of linear isotropic elasticity theory. Uniqueness of solution. Reduction to two dimensions: the plane problem, torsion, bending. General orthogonal coordinance and special application to polar coordinates. Three-dimensional problems with axial symmetry. Prerequisite: MatE 316. Widera, Winter.

304. Experimental Stress Analysis. 4 Hours. Structural similitude and dimensional analysis. Brittle coating. Introduction to photoelasticity. Strain measurement techniques. Prerequisite: MatE 206.

305. Mechanical Instrument Transducers. 4 Hours. Design and operation, calibration and environmental testing, input-output characteristics, digital output transducers. Prerequisites: InfE 240, MatE 241, 304.

307. Two-Dimensional Photoelasticity. 4 Hours. Theory and practice; birefringence in homogenous stress fields; analysis of complex two-dimensional stress fields. Prerequisites: MatE 304, 305.

308. Intermediate Vibration Theory. 4 Hours. Analytical and numerical treatment of vibrations induced in n -degree of freedom linear, discrete systems by periodic, shock, and random excitation. Prerequisite: MatE 208. Spilker, Spring.

309. Analysis and Synthesis of Mechanisms II. 4 Hours. Advanced techniques for the analysis and synthesis of motion. Emphasis on planar mechanisms. Roberts-Chebyshev theorem, Euler-Savary equa-

tion. Type, number, and dimensional synthesis. Geometric and algebraic techniques. Applications, computational methods. Prerequisite: MatE 209. Gupta, Winter.

311. Intermediate Dynamics. 4 Hours. Kinematics of a point; space curves. Particle dynamics, orbital motion, moving reference frames. Rigid body dynamics. The inertia tensor, Euler's equations. Hamilton's principle. Generalized coordinates, LaGrange's equations. Prerequisites: MatE 211, Math 220. Schoeberle, Fall, Winter.

312. Nonlinear Oscillations. 4 Hours. Exact and approximate methods of studying vibrations of nonlinear systems. Analytical and graphical techniques. Forced oscillations, self-excited systems, stability criteria. Computer methods. Practical applications. Prerequisite: MatE 208.

313. Applied Dynamics. 4 Hours. Analytical methods in the study of dynamic forces in machines. Application of the methods to linkages, cam-systems, balancing, and critical speeds. Prerequisites: MatE 209, 311. Schoeberle, Winter, Spring.

315. Mechanics of the Human Musculo-Skeletal System. 4 Hours. 4 hours lecture, 2 hours laboratory per week. Same as Bioengineering 315. Use of rigid and deformable body statics and rigid body dynamics to analyze various aspects of the human musculo-skeletal system from the viewpoint of engineering mechanics. Skeletal structure, kinematics of body joints, and mechanical properties of body tissue. Anthropometry, motion range measurement, kinematic analyses, statically determinate and indeterminate analyses of body forces, stress analyses, and dynamic response analyses. Applications of mechanics to health problems. Laboratory experiments and computational projects. Prerequisite: BioE 393 or MatE 204 and 211.

316. Introduction to Continuum Mechanics. 4 Hours. Same as Energy Engineering 316. Cartesian tensors, kinematics of fluids and solids, conservation equations, constitutive equations for simple materials. Examples. Prerequisites: EnrE 211 or MatE 204, Math 220.

321. Structural Analysis II. 4 Hours. Establishment of basic equations governing linear structural systems. Matrix inversion and relaxation solutions. Approximate analyses. Introduction to dynamics of structure. Prerequisites: MatE 205, Math 195. Spilker, Fall.

322. Concrete Technology. 4 Hours. 3 hours, lecture; 2 hours, laboratory. Relations between microstructure and macroproperties, mechanism of fracture, shrinkage and creep, new types of concrete, effects of environment and mixtures. Individual research project involving laboratory and analytic techniques. Prerequisite: MatE 203 or the equivalent.

323. Advanced Design of Metal Structures. 4 Hours. Plate girders; orthotropic plates; bridge design. Industrial and multistory buildings. Suspended structures; composite construction. Prerequisites: MatE 207, 221.

324. Limit Analysis and Design of Structures. 4 Hours. Boundedness principles of perfect plasticity. Application to analysis and design of structures. Prerequisite: MatE 207. Bryant, Spring.

325. Concrete Design of Shell and Plate Structures. 4 Hours. Derivation of membrane and bending theories for shells of revolution, folded plates, and shells of single and double curvature. Application to barrel roofs, domes, and storage tanks. Prerequisites: Math 200 and MatE 225 or 302.

326. Design in Prestressed and Precast Concrete. 4 Hours. Behavior and design of prestressed and precast concrete structures. Prestressing systems; problems of shrinkage, creep, and anchorage. Design of beams, slabs, containment vessels, and piles. Design of precast concrete building systems. Prerequisite: MatE 225. Naaman, Winter.

327. Reliability and Probability in Structural Design. 4 Hours. Design of reinforced concrete and steel structures using reliability, probability, and statistical concepts. Common models of structural behavior. Predicting strength and load variabilities. Designing for specific levels of reliability. Prerequisites: MatE 207 and either 221 or 225.

328. Structural Design in Reactor Engineering. 4 Hours. Current design practices and the ASME Boiler and Pressure Code. Review and application of relevant topics associated with other structural and mechanics courses. Introduction to high temperature design and analyses. Structural components. Safety and reliability considerations. Prerequisite: MatE 205 or 206. Krajcinovic, Spring.

331. Electron Theory of Metals. 3 Hours. Modern physical concepts of metals and alloys. Introduction to wave mechanics. Thermal, electrical, and magnetic properties of metals. Band theory of metals. Prerequisite: MatE 252.

- 332. Advanced Diffraction Analysis. 3 Hours.** Single crystal methods of X-ray diffraction, orientation determination, pole figures, structure determination, precision lattice constant methods. Prerequisite: MatE 299 or the equivalent.
- 333. Design Use of Materials. 4 Hours.** Extreme value statistics, mechanical effects of a notch. Fracture mechanics. Fatigue. Stress rupture. Residual stress effects. Relationships to designed performance. Prerequisite: MatE 230. Rostoker, Winter.
- 334. Metallurgy of Nuclear Materials. 3 Hours.** Basic principles of nuclear reactors, fission, moderation, poisoning, radioactivity. Selection of materials for fuels, cladding, moderators, coolants, and shields with regard to a reactor environment. Radiation effects, heat transfer, environmental problems, reactor safety, and neutron conservation. Prerequisites: Phys 232 or the equivalent, MatE 252.
- 335. Electron Microscopy. 3 Hours.** The electron microscope and its application to the study of surface replicas and thin films of metals, alloys, and other materials. Sources of contrast. Selected area diffraction. Prerequisites: MatE 239, 252. Levinson, Spring.
- 336. Manufacturing Process Principles. 4 Hours.** Interactions between materials, design and manufacturing methods, and manufacturing unit operations. Cost and product characteristics. Prerequisite: MatE 230.
- 337. Process Metallurgy of Iron and Steelmaking. 4 Hours.** Physiochemical principles applied to reduction, conversion, and refining of steel and ferrous alloys. Applications of thermodynamics to equilibrium problems, such as slag-metal equilibria, and applications of process engineering principles to the dynamic behavior of various component systems, such as sinter plants, blast furnaces, and basic oxygen furnaces. Prerequisite: MatE 243.
- 338. Particulate Solids Processing. 4 Hours.** Same as Energy Engineering 338. Mathematical characterization of distribution of particle size; the population balance. Mechanical methods of size classification and size reduction. Energy consideration in the theory of grinding. Fluid-solid and solid-solid separation processes; fluidization of mixed solids, transport of suspensions of solids. Prerequisites: EnrE 211, MatE 230.
- 339. Electronic Materials Processing. 4 Hours.** Methods germane to materials for electronic applications, including magnetic, dielectric, and strain-sensitive materials; semiconductor materials. Prerequisite: MatE 230. Levinson, Fall.
- 340. Construction Engineering. 4 Hours.** Same as Systems Engineering 340. Structure of the construction industry and construction projects. Review of the fundamentals and use of network-based systems, such as CPM and PERT, for the planning and control of construction projects. Methods for considering the effect of time and resource limitations on construction cost. Examples of applications taken from the construction, precast-prestressed, and mobile home industries. Prerequisite: Senior standing. Naaman, Fall.
- 350. Technology of Greek and Roman Metals. 4 Hours.** Same as Archeological Studies 301 and Classics 301. Nontechnical study of Greek and Roman smelting, casting, fabrication techniques. Metals and the metallurgist in the ancient Mediterranean. Anthropology 150, 245, 255; Classics 110, 279; and History 201-204 are recommended.
- 351. Techniques of Greek and Roman Buildings. 4 Hours.** Same as Archeological Studies 302, Architecture 361, and Classics 302. Reconstruction and analysis of ancient buildings from the Aegean Bronze Age to the Roman Empire. Description and demonstration of ancient structural principles. Anthropology 150, 245, 255; Classics 110, 279; History of Architecture and Art 201-204 are recommended.
- 356. Materials in Bioengineering. 4 Hours.** Same as Bioengineering 356. Analysis of materials problems associated with prostheses and other implanted devices, both medical and dental. Prerequisites: MatE 230, BioS 363 or 364. Rostoker, Spring.
- 360. Deformation Processing. 4 Hours.** Principles of deformation processes. Basic methods of problem-solving. Practices and process control. Relations between processing and finished properties. Prerequisites: MatE 201, 230. Rostoker, Fall.
- 361. Deformation Processing Laboratory. 2 Hours.** Measurement and analysis of forces in forging, rolling, drawing, and deep drawing. Effects of material properties, process variables, and friction conditions. Prerequisites: MatE 202, 360. Levinson, Winter.
- 362. Powder Metallurgy. 4 Hours.** Physical attributes of fine powders. Mechanics of pressing. Theories of solid state sintering. Liquid phase sintering. Manufacturing aspects. Prerequisite: MatE 230.
- 363. Advanced Phase Diagrams. 4 Hours.** Ternary phase equilibria in metal systems. Vertical and horizontal sections, methods of construction and interpretation. Examination of quaternary and more complex systems. Application of thermodynamic principles to construction. Prerequisite: MatE 250. Domagala, Spring.
- 364. Polymer Properties and Engineering. 4 Hours.** Polymers and copolymers, molecular architecture, polymer viscoelasticity, rubber elasticity, the glass transition, time-temperature equivalence, melt rheology, crystallization, structure-property relationships. Prerequisite: MatE 230.
- 365. Polymer Processing. 4 Hours.** Use of polymer rheology and heat transfer to describe and analyze the most widely used polymer processing operations: extrusion, injection molding, rotational molding, and blow molding. Methods for processability evaluation of polymers; influence of processing orientation on the structure and properties of polymers. Prerequisite: MatE 230.
- 366. Corrosion and Oxidation of Metals and Alloys. 4 Hours.** Electrochemical concepts in corrosion; polarization, passivation, Pourbaix diagrams. Effects of stress on corrosion. Methods of controlling corrosion. Oxidation at elevated temperatures. Compact oxide scales, porous scales, and oxidation rates. Effects of alloying elements and oxygen pressure on oxidation rate. Methods of controlling oxidation. Prerequisite: MatE 230.
- 367. Ceramics Technology. 4 Hours.** An introductory course in ceramics for engineers. Ceramics as materials of technological importance are examined from the science, engineering, and manufacturing viewpoints. Crystalline and noncrystalline (glass) materials. Special emphasis on applications in industry. Prerequisite: MatE 230.
- 368. Solidification Theory and Practice. 3 Hours.** Theory of solidification and its application to problems in castings and refining of crystalline materials. Prerequisites: MatE 244, 248. Spring.
- 370. Soil Mechanics I. 4 Hours.** The nature of soils and soil deposits; stresses in soil masses; granular materials; stress-strain behavior and shear strength, earth pressures on retaining structures, bearing capacity and settlements of shallow foundations. Two laboratory exercises in stresses and settlements of shallow foundations. Prerequisite: MatE 260. Silver, Winter.
- 371. Soil Mechanics II. 4 Hours.** Concept of effective stress; seepage and pore pressure; stress-strain behavior and shear strength of drained cohesive materials; earth-retaining structures; slope stability. One laboratory exercise in the principle of effective stress. Prerequisite: MatE 370. Silver, Spring.
- 373. Laboratory Determination of Shear Strength of Soils. 4 Hours.** Approximately 4 hours per week of laboratory-lecture. Prerequisite: Credit or concurrent registration in MatE 372.
- 381. Noise and Vibration Control. 4 Hours.** Nature of sound as it relates to the control of vibration and wave propagation. Design procedure based on hearing, acoustical environment, acoustical materials, and soil dynamics. Legal and medical problems. Prerequisite: MatE 208 or the equivalent. Widera, Winter.
- 383. Design of Film Bearings. 4 Hours.** Application of mechanics to the design of film bearings. Journal bearings. Thrust bearings. Slider bearings. Cavitation cooling requirements. Materials and manufacturing consideration. Prerequisites: EnrE 211, Math 220. Lemke, Spring.
- 385. Polymer Product Design. 4 Hours.** Various classes of polymers, short-term and long-term mechanical behavior, degradation, chemical attack, surface properties, application to polymer product design. Prerequisite: MatE 230.
- 391. Seminar. 1 to 4 Hours.** May be repeated for credit. Topics of mutual interest to a faculty member and a group of students. Offered as announced by department bulletin or the Timetable. Prerequisite: Consent of the instructor.
- 393. Special Problems. 2 to 4 Hours.** Special problems or reading by special arrangement with the faculty. Prerequisite: Consent of the instructor.
- 396. Senior Design I. 4 Hours.** Introduction to engineering economics, legal and social constraints on design, safety and reliability theory, and the use of simulation and optimization techniques in the engineering design process. Prerequisites: Senior standing and completion of all core requirements in the College of Engineering. Fall, Winter.
- 397. Senior Design II. 4 Hours.** Application of principles of

engineering and engineering design methodology to the solution of a large-scale design problem. Prerequisite: MatE 396. Fall, Spring.

Courses for Graduate Students

402. Applied Elasticity II. 4 Hours. Development of classical plate equation and boundary conditions, solution of problems in rectangular and polar coordinates; energy principles; plates with variable thickness; large deflection theory; effect of shear deformations. Prerequisite: MatE 302.

403. Theory of Elasticity II. 4 Hours. Review of complex variable theory, application to torsion, bending, and plane problem. The general three-dimensional problem, stress functions, singularities. Introduction to elastokinetics. Prerequisite: MatE 303.

404. Plasticity I. 4 Hours. Basic postulates of plasticity. Yield conditions and associated flow laws. Torsion of cylindrical and prismatic bars. Generalized stresses and strain rates. Theorem of limit analysis. Application of limit analysis to plane problems, plates, and shells. Prerequisite: MatE 316.

405. Experimental Wave Propagation. 4 Hours. Experimental investigations of wave propagation in bounded elastic media, waves in imperfectly elastic media, stress waves and fracture. Prerequisite: MatE 304.

406. Theory of Shells. 4 Hours. Differential geometry, geometry of deformation, equations of equilibrium, energy theories, membrane theory, general bending theory. Application to shells of different geometry. Prerequisites: MatE 302, Math 322.

407. Fracture Mechanics. 4 Hours. Theoretical strength of solids. Macroscopic fundamentals of fracture. Griffith theory. Stress-intensity factors. Maximum stress theory. Barenblatt-Dugdale theory. Strain-energy-density theory. J-integral theory. Mixed-mode fractures. Applications. Prerequisite: MatE 303 or 333.

408. Theory of Viscoelasticity. 4 Hours. Establishment of the field equation of viscoelastic materials and mathematical techniques of solving these equations. Prerequisites: MatE 303, Math 322.

409. Analysis and Synthesis of Mechanisms III. 4 Hours. Advanced analysis and synthesis of motion, emphasis on spatial mechanisms. Screw chains, dual numbers, quaternions. Matrix methods, stretch-rotation tensors, canonical systems and instantaneous invariants. Applications. Prerequisite: MatE 309.

411. Vibrations of Structural Elements. 4 Hours. Analytic and numerical treatment of vibrations in elastic strings, beams, plates, and other elements. Prerequisite: MatE 308.

412. Wave Propagation in Solids I. 4 Hours. Stress wave propagation in solids; emphasis on waves involving one space variable in linear and nonlinear materials. Analytical and experimental techniques. Laboratory demonstrations. Prerequisites: MatE 302, Math 322.

413. Wave Propagation in Solids II. 4 Hours. Wave propagation in solids that involve more than one space variable. Waves in a half-space due to a pulse on the surface or inside the half-space. Waves in cylindrical rods, beams, and plates. Scattering problems. Wave front analysis by geometrical optics. Prerequisite: MatE 412.

414. Analytical Engineering Dynamics I. 4 Hours. Lagrangian formulation of mechanics. Generalized kinematics. Partial rates of change of position and orientation. Lagrange's form of D'Alembert's principle. Lagrangian statics. Lagrange's equations of the first and second kind. Virtual work. Activity-energy. Prerequisite: Math 321.

415. Analytical Engineering Dynamics II. 4 Hours. Continuation of advanced mechanics, integration of Lagrange's dynamical equations. Hamilton's canonical equations. The energy integral. Momentum integrals and cyclic coordinates. Canonical variables and transformations. The Hamilton-Jacobi equation. Prerequisite: MatE 414.

417. Advanced Strain Gage Techniques. 4 Hours. Advanced applications of strain gages; resistance strain gage at elevated and oxygenic temperatures, effects of hydrostatic pressure, imbedded strain gages; pneumatic and capacitance strain gages and radiation sensitivity. Prerequisite: MatE 304.

419. Nonlinear Continuum Mechanics I. 4 Hours. Same as Energy Engineering 419. Kinematics and fundamental laws of mechanics. General constitutive equations; reduced constitutive equations. Homogeneous motions of simple bodies. Isotropic group, simple flu-

ids, simple solids, simple subfluids. Examples. Prerequisite: MatE 316. Ting, Winter.

420. Nonlinear Continuum Mechanics II. 4 Hours. Same as Energy Engineering 420. Special classes of materials. Simple fluids, viscometric flows, the Weissenberg effect. Isotropic elastic materials, exact solutions. Wave propagation. Thermodynamics. Nonlinear viscoelastic materials, polar materials, and other materials. Prerequisite: MatE 419.

421. Structural Analysis III. 4 Hours. Applications of matrix, numerical, and computer techniques to the analysis of complex structural systems; finite element techniques for linear problems. Prerequisites: MatE 316, 321.

422. Advanced Design of Reinforced Concrete Structures. 4 Hours. Behavior and design of reinforced concrete members subjected to flexure, shear, torsion, and compression; problems of bond failure, creep, and crack width control; limit design of continuous beams and yield line analysis of slabs; consideration of safety and probability in design codes. Prerequisite: MatE 225 or the equivalent.

423. Elastic Instability I. 4 Hours. Principles of elastic instability and their analytical, numerical, and experimental treatment. Buckling of columns, frames, rings. Lateral and torsional instability. Prerequisites: MatE 302 and a knowledge of partial differential equations.

424. Elastic Instability II. 4 Hours. General discussion: small displacements superimposed on finite deformations; application to plates and shells; post-buckling analysis; dynamic instability. Prerequisites: MatE 423 and a knowledge of partial differential equations.

425. Structural Dynamics. 4 Hours. Development of discrete element and numerical techniques for structural dynamics problems; application to seismic and blast analysis. Prerequisites: MatE 308, 321.

426. Advanced Design of Prestressed Concrete Structures. 4 Hours. Optimum flexural design in prestressed concrete. Methods of analysis for continuity in prestressed members. Design of typical structures, such as bridges, building frames, vessels, soil anchors, and the like. Design of joints and connections. Special topics and techniques, such as fire resistance, fatigue, durability, and chemical prestressing. Prerequisite: MatE 326.

427. Advanced Reliability and Probabilistic Structural Design. 4 Hours. Reliability of structures against collapse and unserviceability. Optimum design of metal and concrete structures based on incremental cost-benefit. Concepts of probabilistic codes for structural design. Prerequisite: MatE 327.

429. Computerized Design of Reinforced and Prestressed Concrete Structures. 4 Hours. Some currently used computer programs—such as STRUDL and PCA—implementing the design and analysis of reinforced and prestressed concrete structural systems. Building frames and bridges, retaining structures, slabs, vessels in reinforced concrete, and simple span and continuous bridges in prestressed concrete. The ACI-318-71 Building Code and the latest AASHTO specifications. Points out research needs in the field. Prerequisite: MatE 326.

436. Metallurgy of Electrodeposited Metals and Alloys. 4 Hours. Elements of electrodeposition of metals and alloys from aqueous solution and molten salts. Metallurgical characteristics of materials. Influence of system variables. High temperature processes. Electroless deposits. Anodic oxidation. Prerequisite: MatE 333.

447. Advanced Soil Engineering I. 4 Hours. Analysis of displacements of structures due to earth deformation. Site exploration; analysis of foundation types; shallow and deep foundations; settlements; bearing capacity. Retaining structures. Prerequisite: MatE 261. Silver, Spring.

463. Fundamentals of Friction, Lubrication, and Wear. 4 Hours. Measurement and theories of friction. Adhesion between similar and dissimilar material pairs. Mechanisms of wear. Boundary, thin-film, hydrodynamic and elastohydrodynamic lubrication. Prerequisite: MatE 230.

465. Advanced Metallurgical Thermodynamics. 4 Hours. Treatment of multicomponent system thermodynamics with emphasis on metallurgical process applications. Development of relation between structure of metallic solutions, molten salts, and quasi-chemical models. Introduction to the relations between defects in nonmetallic crystals and the gas-phase composition. Prerequisite: EnrE 305.

466. Embrittlement Phenomena I. 4 Hours. Phenomenology of me-

chanics of cracking or rupture originating from combinations of temperature, microstructure, environment, and stress. Prerequisite: MatE 333. Rostoker, Winter.

467. Embrittlement Phenomena II. 4 Hours. Continues Materials Engineering 466. Prerequisite: MatE 466. Rostoker, Spring.

493. Special Problems. 1 to 4 Hours. Special topics, seminars, or other special activities.

494. Special Topics in Process Metallurgy. 0 to 4 Hours. May be repeated for a maximum of 12 hours. Selected topics of special interest in the design and analysis of mineral and metal production processes, including transport phenomena, physical chemistry, and design, control, and optimization problems. Prerequisite: MatE 248 or the equivalent. Arita, Fall.

495. Special Topics in Physical Metallurgy. 4 Hours. May be repeated for a maximum of 12 hours. Selected topics of current interest drawn from such areas as structures, kinetics, diffusion, and quantitative metallography. Prerequisite: Consent of the instructor.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Individual research: reading, design, analytical studies, or laboratory assignments. Culminates in report, master's thesis, or doctoral thesis. Examination on report or thesis is required.

MATHEMATICS

Philip Dwinger, Head of the Department
Neil W. Rickert, Director of Graduate Studies

Professors: Herbert J. Alexander, A.O.L. Atkin, Eugene M. Barston, Aldridge K. Bousfield, Herbert J. Curtis, Philip Dwinger, Irwin K. Feinstein, Paul Fong, David Foulser, Evelyn Frank (Emeritus), V.K.A.M. Gugenheim, Louise Hay, A. Hedayat, Noboru Ito, Richard Larson, Louis L. Pennisi, Vera Pless, W.F. Stinespring, Victor Twersky, Karen K. Uhlenbeck.

Associate Professors: John T. Baldwin, Neil E. Berger, Joel D. Berman, C.P. Calderon, Brayton I. Gray, Floyd B. Hanson, Melvin L. Heard, Steven L. Jordon, Louis H. Kauffman, Jeff E. Lewis, Jeffrey S. Leon, Charles S.C. Lin, John M. Masley, James Moeller, David E. Radford, T.E.S. Raghavan, G.V. Ramanathan, Neil W. Rickert, Yoram Sagher, Stanley L. Sclove, Frederick Smith, Martin C. Tangora, David Tarkatoff, Philip D. Wagreich, John W. Wood

Assistant Professors: Emad A.W. El-Neweiki, Susan Friedlander, James L. Heitsch, S.Y. Robert Li, Wen-Ching Winnie Li, Howard A. Masur, Douglas E. Miller, Joshua F. Rabinowitz, C. Bennett Setzer, Stephen D. Smith, Charles Tier

The department offers work leading to the Master of Arts, the Master of Science, the Master of Science in the Teaching of Mathematics, the Doctor of Arts, and the Doctor of Philosophy.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, a grade point average of at least 3.75 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study, and an average of 4.00 in all mathematics courses beyond calculus.

Applicants must also present 30 quarter hours of undergraduate work in mathematics in addition to the usual beginning courses in algebra, trigonometry, analytic geometry, and

calculus. For the Master of Science or Master of Arts in Mathematics, these 30 hours must include one year of work in analysis (equivalent to Mathematics 310, 311, 312; or 313, 314, 315) and one year of work in an introduction to higher algebra (equivalent to Mathematics 240, 345, 346; or 240, 346, 347). For the Master of Science in the Teaching of Mathematics, these 30 hours must include one course in advanced calculus (Mathematics 311 or equivalent), two courses in higher algebra (Mathematics 240 and 346 or equivalent), and at least one course concerned with the problems of teaching secondary school mathematics. The remaining hours should be mathematics courses at the 300 level (or their equivalents). Degree requirements are stated below.

Applicants are required to take the Graduate Record Examination (verbal and quantitative and advanced), to submit three letters of recommendation from persons familiar with their academic work, and to submit transcripts in accordance with the requirements of the Graduate College. A candidate who is admitted with deficiencies in courses normally required for admission must remove such deficiencies during the first three terms of attendance. No degree credit is given for such courses.

Each student is assigned a faculty adviser who assists in selecting an appropriate program of study. Students also receive a handbook that contains certain details, comments, and suggestions on graduate work in the department.

Nondegree Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and must normally have completed a calculus sequence and at least two mathematics courses at a more advanced level.

Degree Requirements

Master of Arts and Master of Science in Mathematics

Forty-eight quarter hours are required for the degree, of which at least 36 must be in mathematics. At least 20 of the 36 hours must be in approved 400-level courses. Only 4 of these 20 hours may be in Mathematics 497. The candidate must pass a written examination, details of which may be obtained from the department director of graduate studies. A thesis is not required.

Master of Science in the Teaching of Mathematics

The purpose of this program is to strengthen the preparation of present and future secondary school teachers of mathematics and, in particular, to provide courses leading to certification in Illinois for those candidates who are not already certified.

A candidate must earn 48 quarter hours of graduate credit, of which 24 hours must be in mathematics and 24 hours in electives approved by the adviser. If a candidate does not hold a certificate to teach secondary school mathematics in Illinois, then 12 of the elective hours must be in psychology or education. At the conclusion of this program the student must have completed, either as part of the required 48 quarter hours or as part of the admission requirements, the following:

1. At least 4 quarter hours of analysis beyond Mathematics 311, usually Mathematics 312.
2. At least 4 quarter hours of algebra beyond Mathematics 240 and 346, usually 345 or 347.
3. Mathematics 303, 304, 305, and at least 4 quarter hours of geometry beyond Mathematics 305, usually Mathematics 350.
4. At least 12 quarter hours of graduate credit in mathematics

to be chosen, with the approval of the adviser, from logic, finite differences, number theory, history of mathematics, topology, computer science, probability and statistics, or other fields.

In addition, the candidate must be eligible for a certificate to teach mathematics at the secondary level in Illinois. This requirement may be waived for candidates with teaching experience.

The electives must be chosen with the approval of the adviser. In general, they are chosen from courses in mathematics. In exceptional cases courses in other fields may be used as electives. Courses at the 400 level are not required for the degree.

Candidates whose undergraduate work is comparable to that required at Chicago Circle for a Bachelor of Science in the Teaching of Mathematics can fulfill the requirements in one year of full-time study. The requirements can also be satisfied through evening and summer courses.

For further details concerning certification and any other requirements, candidates should consult the program adviser.

Doctor of Arts

The program leading to the Doctor of Arts in Mathematics requires the study of the major areas of mathematics and study and research in the methodology and techniques that make for the successful teaching of mathematics. The program is designed to train educators for undergraduate instruction in universities and in four-year, community, and junior colleges. A total of 144 hours of credit is required, distributed as follows:

- A. 60 quarter hours of mathematics, including Mathematics 330, 331, 355, 401, 402, 430, and 431. In addition, the student must obtain at least 4 quarter hours of credit in each of any four of the following areas: computer science, differential equations, geometry, logic, and probability and statistics. The remaining 16 quarter hours are selected by the student with the approval of the adviser. At least 32 of the 60 quarter hours must be taken in mathematics courses at the 400 level.
- B. 12 quarter hours of graduate courses in a related science, such as physics, chemistry, biology, geology, physical geography, or another science with the approval of the department.
- C. 24 quarter hours of graduate courses in education and mathematics education directed toward the improvement of university and junior college teaching.
- D. A teaching practicum, directed and supervised by members of the department, for which 8 quarter hours of credit are awarded. Doctor of Arts candidates who have had teaching experience may request a proficiency examination to satisfy the teaching practicum requirement. A committee of members of the department prepares and offers the examination.
- E. 8 quarter hours of electives restricted to mathematics and/or science. Courses in economics and statistical methods in psychology and education may, under certain conditions, be selected in this category.
- F. 32 quarter hours are devoted to the writing of a thesis, either an expository or historical treatment of a mathematics topic or a research project on mathematics education.

Each student is required to pass the department master's examination within one year of completing 48 quarter hours of credit, except that the student who already has a master's degree upon entering the program must pass the examination within one year of entrance. Within one year after completing the teaching practicum and 120 hours of course credit, a student must pass a preliminary examination in accordance with the rules of the Graduate College. Finally, the student must defend the thesis at the doctoral examination.

Doctor of Philosophy

Each candidate for the doctorate must pass the master's examination and must be recommended by the department for further work. A candidate who enters with a master's degree in mathematics from another institution must pass either the master's examination or the written preliminary examination within one year of admission in order to remain in the program. In exceptional circumstances the department may extend this time limit.

The student chooses a major subject from the following: algebra, analysis, applied mathematics, geometry, logic, mathematical computer science, number theory, probability and statistics, or topology. Two internal minors must be chosen from the preceding list, or one internal minor and one outside minor, or a full outside minor. The choice of an outside minor must have the approval of the Department of Mathematics; the requirements should be checked with the department concerned. The student presents at least 60 quarter hours in 400-level mathematics courses, except that for a student with a full 24 hours outside minor, 48 quarter hours of 400-level mathematics courses will suffice. At least three 400-level courses are required for each internal minor, and they must have the approval of the department. The student is required to have 144 hours of graduate credit, of which 48 hours are usually thesis credit.

Shortly before the completion of 96 hours of graduate course work, the student should select an adviser to direct a thesis in the major area of interest. As soon as possible thereafter, the student must take a preliminary examination, the purpose of which is to determine readiness to undertake a doctoral research program. The exact point in the student's career at which the preliminary examination must be taken is not rigidly fixed, but the department will normally drop a student who has not passed the preliminary examination within one year of completion of the 96 hours of course work. In exceptional circumstances the department may extend this time limit. Further details regarding the examination may be obtained from the director of graduate studies.

The student must demonstrate reading proficiency in any two of French, German, or Russian. Other languages may be approved by the department in some cases.

Since the purpose of the doctoral program is to provide training in mathematical research and scholarship, the crucial effort is the production of a thesis; therefore, under the guidance of the department, the student writes a thesis that is a significant piece of mathematical research acceptable to the department.

Courses for Graduate and Advanced Undergraduate Students

300. Teachers Course I. 4 Hours, Graduate; 3 Hours, Undergraduate. Graduate credit for this course may be applied only toward the course requirements for the Master of Science in the Teaching of Mathematics. Important mathematical concepts and the problems involved in the teaching thereof; treatment of numeration systems, set relations, functions, whole numbers, logic, and proof; examination of some of the major new curricula. Prerequisite: Math 133.

301. Teachers Course II. 4 Hours, Graduate; 3 Hours, Undergraduate. Graduate credit for this course may be applied only toward the course requirements for the Master of Science in the Teaching of Mathematics. Continues Mathematics 300. Topics, discussed from an advanced viewpoint, include mathematical induction, the completeness axiom, composition of functions, sequences, a vector approach to geometry, axioms of the Hilbert type. Prerequisite: Math 300.

302. Teachers Course III. 4 Hours, Graduate; 3 Hours, Undergraduate. Graduate credit for this course may be applied only toward the course requirements for the Master of Science in the Teaching of Mathematics. Continues Mathematics 301. Topics, discussed from an

advanced viewpoint, include arithmetic and geometric progressions, continued sums and products, difference sequences, pigeonhole principle, limits, continuity, exponential functions, logarithmic functions, circular functions, combinations and permutations. Prerequisite: Math 301.

303. Advanced Euclidean Geometry I. 4 Hours, Graduate; 3 Hours, Undergraduate. Graduate credit for this course may be applied only toward the course requirements for the Master of Science in the Teaching of Mathematics. Geometry from Euclid to the present, equivalents of Euclid's fifth postulate, noneuclidean geometries, invariants of configurations under transformation. Prerequisite: Math 133.

304. Advanced Euclidean Geometry II. 4 Hours, Graduate; 3 Hours, Undergraduate. Graduate credit for this course may be applied only toward the course requirements for the Master of Science in the Teaching of Mathematics. The parallel postulate, similarity, area, perpendicularity, circles and spheres, constructions with ruler and compass. Prerequisite: Math 303.

305. Advanced Euclidean Geometry III. 4 Hours, Graduate; 3 Hours, Undergraduate. Graduate credit for this course may be applied only toward the course requirements for the Master of Science in the Teaching of Mathematics. Ruler and compass constructions, proportionality, length and area, solid mensuration, hyperbolic geometry. Prerequisite: Math 304.

306. Computer Modeling in the Behavioral Sciences. 4 Hours. Same as Psychology 358. Monte Carlo simulation; goodness of fit; process models versus stochastic models; protocol analysis; list processing; models of problem solving, learning, memory, language processing, pattern recognition, social interaction, and psychopathology. Prerequisites: Math 194 or 195, Math 280, and consent of the instructor.

307. Theory of Sets and the Real Number Systems. 5 Hours. The elementary set theory and the development of the integers, the rational numbers, and the real numbers. Prerequisite: Math 133.

309. Topics in the Teaching of Mathematics. 4 Hours. Graduate; 3 Hours, Undergraduate. May be repeated for credit. No more than 8 hours may be used toward the Master of Science in the Teaching of Mathematics. Seminars, conferences, or sections on special topics and advanced problems for students majoring in mathematics education and for in-service teachers who wish to study new-curriculum development and special problems in teaching mathematics. Prerequisite: Math 302.

310. Advanced Calculus I. 4 Hours. Differential and integral calculus of vector fields, vector functions, line and surface integrals, Green's theorem, Stokes's theorem, divergence theorem, curvilinear coordinates. Prerequisite: Math 133.

311. Advanced Calculus II. 4 Hours. Graduate; 3 Hours, Undergraduate. Functions of several variables, partial differentiation, differentials, chain rule, extremal problems. Lagrange multipliers, mean value theorem, Taylor's formula and series, implicit and inverse functions theorems, transformations and mappings, Jacobians. Prerequisite: Math 133.

312. Advanced Calculus III. 4 Hours, Graduate; 3 Hours, Undergraduate. Sequences, infinite series, power series, convergence tests, uniform convergence, improper integrals, beta and gamma functions, Laplace transform. Prerequisite: Math 311.

313. Analysis I. 4 Hours, Graduate; 3 Hours, Undergraduate. The real numbers, countable and uncountable sets, the topology of the reals, compactness, convergent and divergent sequences, Cauchy sequences, infinite series, convergence tests, rearrangements, the topology of n -space, continuous functions and their properties. Prerequisite: Math 133.

314. Analysis II. 4 Hours, Graduate; 3 Hours, Undergraduate. The derivative, mean value theorems, Taylor's theorem with remainder, the Riemann integral, integrability of continuous functions, the fundamental theorem of calculus, convergence of sequences and series of functions, uniform convergence, conditions for piecewise differentiability and integrability, power series. Prerequisite: Math 313.

315. Analysis III. 4 Hours. Differentiation in n -space, partial derivatives, the derivative as a linear approximation, inverse and implicit function theorems, integration in R^n , change of variables in integration, differential forms and integration of differential forms, Stokes's theorem. Prerequisite: Math 314.

321. Elementary Differential Equations II. 4 Hours, Graduate; 3

Hours, Undergraduate. Systems of linear first order equations. Boundary value problems for second order linear equations, introduction to partial differential equations. Nonlinear problems described by one or two differential equations of the first order. Prerequisite: Math 220.

322. Elementary Partial Differential Equations I. 4 Hours, Graduate; 3 Hours, Undergraduate. Second order partial differential equations and their initial value and boundary value problems. Separations of variables and Green's formula considerations. Eigenfunction expansions for homogeneous and inhomogeneous heat equation in finite domains. Sturm-Liouville problem. Fourier series. Prerequisite: Math 321.

323. Elementary Partial Differential Equations II. 4 Hours, Graduate; 3 Hours, Undergraduate. The potential equation and the wave equation in finite domains. Semi-infinite and infinite domains. Fourier integrals. Cylindrical and spherical harmonics. Fourier-Bessel and Legendre-Bessel expansions. Prerequisite: Math 322.

324. Special Functions in Pure and Applied Mathematics I. 4 Hours, Graduate; 3 Hours, Undergraduate. Special functions, including gamma, beta, cylinder, hypergeometric, and Bessel functions, as they occur in pure and applied mathematics and engineering. Prerequisite: Credit or registration in Math 321.

325. Special Functions in Pure and Applied Mathematics II. 4 Hours, Graduate; 3 Hours, Undergraduate. Special functions and polynomials, including orthogonal, Legendre, Hermite, Laguerre, and Jacobi polynomials, as they occur in pure and applied mathematics and engineering. Prerequisite: Math 324.

326. Special Functions in Pure and Applied Mathematics III. 4 Hours, Graduate; 3 Hours, Undergraduate. Special functions, including hypergeometric and Bessel functions, generating functions, and orthogonal, Legendre, Hermite, Laguerre, and Jacobi polynomials. Prerequisite: Math 325.

330. Complex Analysis with Applications I. 4 Hours, Graduate; 3 Hours, Undergraduate. Complex numbers and their geometrical representation, analytic functions, elementary functions, complex integration, Taylor and Laurent series, the calculus of residues, introduction to conformal mapping. Prerequisite: Math 310 or 311 or 313 or 321.

331. Complex Analysis for Applications II. 4 Hours, Graduate; 3 Hours, Undergraduate. Branch-point integration, series and product expansions, complex integral representations of special functions (gamma, hypergeometric, Legendre, Bessel), asymptotic methods, introduction to transforms. Prerequisites: Math 321, 330.

343. Formal Logic I. 4 Hours, Graduate; 3 Hours, Undergraduate. Same as Philosophy 343. Propositional logic, logic of quantifiers, and identity and completeness. Prerequisite: Consent of the instructor; none for mathematics majors.

344. Formal Logic II. 4 Hours, Graduate; 3 Hours, Undergraduate. Same as Philosophy 344. Continues Mathematics 343. Mathematical analysis of decidability and computability. Arithmetization of syntax. Incompleteness and undefinability theorems. Introduction to axiomatic set theory. Prerequisite: Math 343.

345. Linear Algebra II. 4 Hours, Graduate; 3 Hours, Undergraduate. Inner product spaces, bilinear and quadratic forms, canonical forms of linear transformations. Prerequisite: Math 240.

346. Abstract Algebra I. 4 Hours, Graduate; 3 Hours, Undergraduate. Introduction to abstract algebraic structures, rings, commutative rings, groups. Prerequisite: Math 133.

347. Abstract Algebra II. 4 Hours, Graduate; 3 Hours, Undergraduate. Integral domains, polynomial rings, quotient rings, fields, finite groups. Prerequisite: Math 346 or the equivalent.

348. Linear Transformations and Matrices. 5 Hours. Matrix algebra, determinants, inverses of a matrix, rank and equivalence, linear independence, vector spaces and linear transformations, eigenvalues and eigenfunction expansions. Prerequisite: Math 133.

350. Introduction to Higher Geometry I. 4 Hours, Graduate; 3 Hours, Undergraduate. The projective plane and its subgeometries, perspectivities, conics; the Euclidean plane, isometries, line reflections, conics, bilinear forms, hyperbolic planes, isometries, Witt's theorem. Prerequisite: Math 240, 346.

351. Introduction to Higher Geometry II. 4 Hours, Graduate; 3 Hours, Undergraduate. Non-Desarguesian projective planes, higher dimensional projective spaces, coordinatization, the orthogonal groups. Prerequisite: Math 350.

353. Introduction to Differential Geometry. 4 Hours, Graduate; 3 Hours, Undergraduate. Curves, surfaces, manifolds imbedded in euclidean space, Riemannian geometry, first and second fundamental forms of imbedded surfaces. Prerequisite: Math 312 or 315.

355. Introduction to Topology I. 4 Hours, Graduate; 3 Hours, Undergraduate. Topological spaces, continuous functions, homeomorphism, connectedness, compactness, separation axioms, and other topics. Prerequisite: Math 310 or 311 or 313.

356. Introduction to Topology II. 4 Hours, Graduate; 3 Hours, Undergraduate. Continues Mathematics 355. Locally connected spaces, arcs and arcwise connectivity, Cantor sets, and other topics in general topology. Prerequisite: Math 355.

357. Introduction to Topology III. 4 Hours, Graduate; 3 Hours, Undergraduate. Classification of surfaces; fundamental group and covering spaces. Other topics in algebraic topology or related areas of general topology. Prerequisites: Math 346, 356.

358. Statistical Methods I. 4 Hours, Graduate; 3 Hours, Undergraduate. Statistical concepts, techniques, and methods. Topics include probability theory and models, statistical estimation, confidence limits, and hypothesis testing. Prerequisite: Math 370.

359. Statistical Methods II. 4 Hours, Graduate; 3 Hours, Undergraduate. Regression analysis, experimental design and analysis, non-parametric methods. Prerequisite: Math 358.

360. Elementary Theory of Numbers I. 4 Hours, Graduate; 3 Hours, Undergraduate. The basic concepts: divisibility, prime numbers congruences, quadratic reciprocity law. Prerequisite: Math 133 or consent of the instructor.

361. Theory of Numbers II. 4 Hours, Graduate; 3 Hours, Undergraduate. Functions of number theory, recurrence functions, diophantine equations, quadratic forms, Farey sequences and rational approximations. Prerequisite: Math 360.

362. Theory of Numbers III. 4 Hours, Graduate; 3 Hours, Undergraduate. Continued fractions, distribution of primes, algebraic numbers, polynomials, partitions, density of sequences of integers. Prerequisite: Math 361.

366. Introduction to the Mathematical Methods of Theoretical Physics I. 4 Hours. Same as Physics 366. The traditional mathematical methods of theoretical physics from an intuitive point of view. Applications to problem-solving in electrostatics and classical and quantum mechanics. Matrices and linear transformations, Fourier analysis, the partial differential equations of physics, and Sturm-Liouville theory. Introduction to special functions frequently encountered in physics. Prerequisites: Math 220, 310.

367. Introduction to the Mathematical Methods of Theoretical Physics II. 4 Hours. Same as Physics 367. The traditional mathematical methods of theoretical physics from an intuitive point of view. Applications to problem-solving in electrostatics, electrodynamics, and classical and quantum mechanics. The special functions frequently encountered in physics and their use in the solution of boundary value problems, power series solutions, Green's functions, contour integral representations, and additional uses. Prerequisite: Math 366.

369. Introduction to Error Correcting Codes. 4 Hours, Graduate; 3 hours, Undergraduate. The general theory of codes. Finite fields, cyclic codes, Hamming codes, Golay codes, Reed-Muller codes, quadratic residue codes, and various decoding algorithms. Prerequisite: Math 240 or 348.

370. Introduction to Probability. 4 Hours, Graduate; 3 Hours, Undergraduate. Probability models, univariate and multivariate distributions, random variables. Prerequisite: Math 133.

371. Mathematical Statistics I. 4 Hours, Graduate; 3 Hours, Undergraduate. Statistical problems and procedures, estimation, testing hypotheses, distribution theory. Prerequisite: Math 370 or 358.

372. Mathematical Statistics II. 4 Hours, Graduate; 3 Hours, Undergraduate. One-sample problems, comparison, linear models, and analysis of variance. Prerequisite: Math 371.

375. Probability. 4 Hours, Graduate; 3 Hours, Undergraduate. Law of large numbers, central limit theorem, recurrent events, random walks, Markov chains. Prerequisite: Math 370.

376. Applied Probability Model. 4 Hours, Graduate; 3 Hours, Undergraduate. Poisson and compound Poisson processes; recurrent events and renewal theory; Markov chains and processes; branching and birth-and-death processes; stationary stochastic processes; notion

of Gaussian and Wiener processes. Application to traffic and queueing, system reliability, storage and inventory, epidemics. Prerequisite: Math 375.

377. Finite Differences I. 4 Hours, Graduate; 3 Hours, Undergraduate. Difference formulas, finite integration, summation of series, Bernoulli and Euler polynomials, interpolation. Prerequisite: Math 112 or 133.

378. Finite Differences II. 4 Hours, Graduate; 3 Hours, Undergraduate. Approximate integration, beta and gamma functions, difference equations. Prerequisite: Math 377.

379. Theory of Sample Survey. 4 Hours, Graduate; 3 Hours, Undergraduate. Theory of sampling from finite populations. Efficiency of various survey designs. Prerequisite: Math 372 or 359.

380. Problems in Graph Theory. 4 Hours. May be substituted for Systems Engineering 460. Credit is not given for both Mathematics 380 and Systems Engineering 460. Same as Quantitative Methods 380. Optimization problems: theory and solution. Shortest path problems. Transportation problems: maximum flows, dynamic flows, parametric flows. Matching problems; coverings, spanning trees, perfect graphs. Urban scheduling problems; traveling salesman problem, postman problem. Prerequisite: QM 376.

381. Vector and Tensor Analysis I. 4 Hours, Graduate; 3 Hours, Undergraduate. Algebra of vectors, vector differential calculus, differential geometry, Stokes's theorem, divergence theorem, applications of electricity, mechanics, hydrodynamics, and elasticity. Prerequisite: Math 311 or 314 or consent of the instructor.

382. Vector and Tensor Analysis II. 4 Hours, Graduate; 3 Hours, Undergraduate. Transformation properties, covariant and contravariant components, dyadic form of tensors, differential geometry of curves and surfaces, exterior differential calculus with emphasis on aspects of interest in science and engineering. Prerequisite: Math 381.

383. Introduction to Game Theory. 4 Hours. Extensive games, perfect information, perfect recall, almost complete information, normal form, equilibrium points, saddle point, minimax theorem, examples from parlor games, simplified poker, computing value and optimal strategies using simplex method, values for n person cooperative games. Applications to problems to economics. Prerequisite: Math 370.

384. Mathematical Optimization Techniques. 4 Hours, Graduate; 3 Hours, Undergraduate. Classical optimization techniques; derivatives and Lagrange multiplier. Linear programming; the simplex algorithm. Quadratic programming. Mathematical programming in general. Kuhn-Tucker conditions. Integer programming; Gomory's algorithm. Prerequisite: Math 341 or 348.

385. Laplace Transforms. 3 Hours. The Laplace transform and its inverse; properties of the transform; linear differential equations (ordinary and partial); linear difference equations, gamma, error, and Bessel functions; asymptotic series; nonelementary integrals; integral equations; Hankel transforms. Prerequisite: Math 330.

386. Combinatorics. 4 Hours, Graduate; 3 Hours, Undergraduate. Permutations, combinations, enumerations, generating functions, recurrence relations, principle of inclusion and exclusion, polya theory of counting, graphs, tree, block designs. Prerequisite: Math 240 or 346 or 348.

387. Numerical Analysis I. 4 Hours, Graduate; 3 Hours, Undergraduate. A comprehensive introduction to linear numerical analysis. Computational methods and error analysis for matrix inversion, eigenvalues and eigenvectors, and linear approximations. Prerequisites: Math 133 and 194 or 195.

388. Numerical Analysis II. 4 Hours, Graduate; 3 Hours, Undergraduate. Continues Mathematics 387. Prerequisite: Math 387.

389. Numerical Analysis III. 4 Hours, Graduate; 3 Hours, Undergraduate. Numerical integration and differentiation. Quadrature in n dimensions. Numerical integration of ordinary differential equations. Prerequisite: Math 388.

390. Special Topics in Computer Science. 1 to 4 Hours. May be repeated for a maximum of 16 hours of credit. Course content is announced prior to each term in which it is given. Prerequisite: Consent of the instructor.

391. Boolean Algebra and Switching Theory. 4 Hours, Graduate; 3 Hours, Undergraduate. Sets, relations, functions, equivalence relations, abstract Boolean algebra. Minimization of Boolean functions. Representation of finite Boolean algebras. Prerequisite: Any

200-level or higher mathematics course.

392. Formal Languages and Automata I. 4 Hours, Graduate; 3 Hours, Undergraduate. Introduction to formal languages; relations between grammars and automata. Prerequisite: Math 391.

393. Formal Languages and Automata II. 4 Hours, Graduate; 3 Hours, Undergraduate. Continues Mathematics 392. Undecidability and computational complexity. Prerequisite: Math 392.

394. Simulation Languages. 4 Hours, Graduate; 3 Hours, Undergraduate. Digital simulation of complex systems; general purpose and special simulation languages and their useful properties, their design and implementation. A comparison and evaluation of special languages, such as GPSS II, SIMSCRIPT, GASP, SIMPAC, DYNAMO, and SIMULATE; application of at least one of them in a term project. Prerequisites: Math 280, 281 or the equivalents.

395. List-Processing Languages. 4 Hours, Graduate; 3 Hours, Undergraduate. List- and string-processing languages, such as IPLV, SLIP, COMIT, SNOBOL, and LISP, from the user's point of view. Applications to nonnumeric problems, such as symbolic formula manipulation, information retrieval, and pattern recognition. Prerequisites: Math 280, 281 or InfE 270.

396. Design of Compilers. 4 Hours, Graduate; 3 Hours, Undergraduate. Design and implementation of algebraic compilers for a modern digital computer. Prerequisites: Math 280, 281.

397. Computer Operating Systems. 4 Hours, Graduate; 3 Hours, Undergraduate. Problems of planning and implementing an operating system for a modern digital computer so as to utilize its power to the fullest possible extent. Prerequisite: Math 281.

398. Special Topics in Mathematics. 1 to 4 Hours. May be repeated for credit. Course content is announced prior to each term in which it is given. Prerequisite: Consent of the instructor.

Courses for Graduate Students

400. Set Theory. 4 Hours. Basic set-theoretic principles and techniques and their use in mathematics; set operations, functions and maps, finite sets and counting orderings, ordinal numbers, transfinite induction, cardinal numbers, axiom of choice and applications.

401. Second Course in Abstract Algebra I. 4 Hours. Isomorphism theorems, permutation groups, finite groups, Sylow's theorems, structure of finitely generated Abelian groups, composition series, solvable groups. Prerequisites: Three of Math 240, 345, 346, 347; or the equivalents. Fall.

402. Second Course in Abstract Algebra II. 4 Hours. Field extensions, finite fields, Galois theory, Wedderburn's theorem. Prerequisite: Math 401. Winter.

403. Second Course in Abstract Algebra III. 4 Hours. Rings and algebras, structure of algebras, multilinear algebra, tensor products. Prerequisite: Math 402. Spring.

404. Rings and Modules. 4 Hours. The category of R -modules, projective and injective modules, the Morita theorems, elementary homological algebra, separable algebras, homological dimension. Prerequisite: Math 403. Alternate years.

405. Finite Groups. 4 Hours. Transfer theorems, p -nilpotent groups E , C , D properties, solvable groups, Schur-Zassenhaus theorem, additional topics selected by the instructor. Prerequisite: Math 403. Alternate years.

406. Free Groups and Universal Properties. 4 Hours. Universal algebras, words and varieties, free algebras, free groups, subgroups of free groups, free products, free associative algebras, Birkhoff-Witt theorem, free Lie algebras. Prerequisite: Math 403. Alternate years.

407. Representation Theory. 4 Hours. Representation theory of finite-dimensional algebras, structure of the regular representation, characters, applications to finite groups, theorems of Frobenius and Burnside, character ring, exceptional characters. Prerequisite: Math 403. Alternate years.

408. Homological Algebra. 4 Hours. Abstract categories and functors, adjoints, additive and Abelian categories, functor categories. Prerequisite: Math 403. Alternate years.

410. Nonassociative Algebras I. 4 Hours. Introduction to non-associative algebras, alternative algebras, power associative algebras, Jordan algebras. Prerequisite: Math 403. Alternate years.

411. Nonassociative Algebras II. 4 Hours. Jordan algebras

continued, Lie algebras, general classification theorems. Prerequisite: Math 410. Alternate years.

412. Number Theory I. 4 Hours. A unified introduction in its classical, analytic, and algebraic aspects. Topics include unique factorization theorem, quadratic reciprocity and Gaussian sums, approximation of real numbers by algebraic numbers, number-theoretic functions, uniform distribution of real sequences. Prerequisites: Math 240, 246, and either 345 or 347. Alternate years.

413. Number theory II. 4 Hours. A unified introduction in its classical, analytic, and algebraic aspects. Topics include lattice points in a convex body, primes in an arithmetic progression, the prime number theory, and p -adic equations. Prerequisites: Math 330 and Math 360 or 412. Alternate years.

414. Number Theory III. 4 Hours. A unified introduction in its classical, analytic, and algebraic aspects. Topics include quadratic forms, quadratic fields, finite algebraic number fields, and Dirichlet's unit theorem. Prerequisite: Math 412 or consent of the instructor. Alternate years.

415. Lattice Theory I. 4 Hours. Introduction to the theory of lattices and partially ordered sets. Modular and distributive lattices, prime ideal theorem, Boolean algebras. Prerequisites: Math 346, 355. Alternate years.

416. Lattice Theory II. 4 Hours. Continues Mathematics 415. Representation theory of distributive lattices and its applications, Boolean algebras in particular. Prerequisite: Math 415. Alternate years.

417. Lattice Theory III. 4 Hours. Special topics. Pseudo-complemented, distributive lattices, Post algebras, Heyting algebras, Stone algebras, Lukasiewicz algebras, de Morgan algebras, alpha complete lattices and their representation theory. Prerequisite: Math 416. Alternate years.

419. Advanced Topics in Algebra. 4 Hours. May be repeated for credit. Special topics. Prerequisite: Consent of the instructor. Alternate years.

421. Algebraic Topology I. 4 Hours. Introduction to homology and cohomology theory and applications. Other topics. Prerequisites: Math 345, 346. Alternate years.

422. Algebraic Topology II. 4 Hours. Homotopy theory. Fibre spaces, homotopy groups. Other topics. Prerequisite: Math 421. Alternate years.

423. Algebraic Topology III. 4 Hours. Selected topics, such as universal coefficient theorems, Kunnet formula, products, duality in manifolds, spectra and generalized (co)homology theories, and spectral sequences. Prerequisite: Math 422. Alternate years.

424. Seminar on Mathematics Curricula. 4 Hours. Analysis of the objectives and goals of undergraduate mathematics programs. Prerequisite: Admission to the Doctor of Arts program in mathematics.

425. Seminar on Mathematics: Philosophy and Methodology. 4 Hours. Problems involved in the teaching and learning of mathematics. Intensive study of the work of Piaget, Gagne, Bruner, Ausabel, Beberman, and others with implications on current teaching methodology in mathematics. Prerequisite: Math 424.

427. Seminar on Teaching Mathematics in Four-Year Colleges. 4 Hours. Analysis of the teaching of the precalculus, calculus, and post-calculus courses in four-year colleges. Prerequisite: Math 424.

429. Advanced Topics in Topology. 4 Hours. May be repeated for credit. Special topics. Prerequisite: Consent of the instructor.

430. Real Analysis I. 4 Hours. Set theory, well-ordering cardinal and ordinal numbers, metric spaces, connectedness, compactness, completeness. Prerequisite: Math 312 or 315 or the equivalent. Fall.

431. Real Analysis II. 4 Hours. Riemann-Stieltjes integral and its extension, measures and measurable sets, measurable functions, the Lebesgue integral. Prerequisite: Math 430. Winter.

432. Complex Analysis I. 4 Hours. Theorems of Mittag-Leffler, Weierstrass, and Runge. Entire functions and Hademard's theorem. Analytic continuation. The Riemann mapping theorem. Prerequisite: Math 431. Winter.

433. Complex Analysis II. 4 Hours. Continues Mathematics 432. Harmonic and subharmonic functions. The Dirichlet problem. Potential theory and Green's functions. Elliptic functions. Introduction to Riemann surfaces. The Picard theorem. Prerequisite: Math 432. Spring.

434. **Transform Methods. 4 Hours.** Mellin and Hankel transforms, multiple Fourier transforms; applications to conduction of heat in solids, to slowing down of neutrons in matter, and to atomic and nuclear physics. Prerequisites: Math 312 or 315, and 331 or the equivalent.
435. **Calculus of Variations. 4 Hours.** Introductory problems; geodesics, the brachistochrone, minimal surface of revolution. Isoperimetric problems. Geometrical optics, Fermat's principle. Dynamics of particles. Minimum characterization of the eigenvalue-eigenfunction problem. Ritz's method of approximation. Prerequisite: Math 312 or 315 or the equivalent.
436. **Functional Analysis I. 4 Hours.** Topological vector spaces, Banach spaces, Hilbert spaces, Hahn-Banach theorem, interior mapping uniform boundedness principle, principle, applications, approximation and closure theorems. Prerequisite: Math 432. Spring.
437. **Functional Analysis II. 4 Hours.** Linear operators on a Banach space, the spectrum and resolvent of a linear operator, compact operators, spectral theorem for compact Hermitian operators on a Hilbert space, integral equations, Sturm-Liouville theory. Prerequisite: Math 436. Alternate years.
438. **Functional Analysis III. 4 Hours.** Spectral theorem for normal operators on a Hilbert space, unbounded operators, semigroups of linear operators, ergodic theorems, H^p spaces of analytic functions, Beurling's theorem on the shift operator, applications. Prerequisite: Math 437. Alternate years.
439. **Integral Equations. 4 Hours.** Fredholm and Hilbert-Schmidt theory and applications, symmetric kernels and orthogonal systems of functions, some types of singular and nonlinear integral equations. Prerequisite: Math 312 or 315 or the equivalent.
440. **Partial Differential Equations I. 4 Hours.** Classification of equations and characteristics. The Cauchy-Kowalewski theorem. The Cauchy problem for hyperbolic systems in the plane and space of higher dimension. Uniqueness theorems for the Cauchy problem. Prerequisites: Math 240 or 348, 321, 331, 431, or consent of the instructor. Alternate years.
441. **Partial Differential Equations II. 4 Hours.** Elliptic equations; method of balayage; Dirichlet's principle; fundamental solutions; potential theory; eigenvalue problems. Prerequisite: Math 440. Alternate years.
443. **Universal Algebra I. 4 Hours.** subalgebras, homomorphism, congruences and congruence lattices, direct and subdirect decomposition, equational classes. Prerequisite: Math 342. Alternate years.
444. **Universal Algebra II. 4 Hours.** Free algebras in arbitrary abstract classes of universal algebras, identities, word problems. Free products and amalgamation. Independence. Projectives and injectives. Prerequisite: Math 443. Alternate years.
446. **Theory of Optimal Design of Experiments I. 4 Hours.** Several optimality criteria for design of experiments; continuous optimal designs; discrete optimal designs; sequential optimal designs; optimal discriminating experiments. Prerequisite: Math 472. Alternate years.
447. **Theory of Optimal Design of Experiments II. 4 Hours.** General techniques for the construction of optimal designs; construction of continuous optimal designs of Resolutions III, IV, V; construction of continuous optimal designs with minimal number of observations; construction of discrete optimal designs. Prerequisite: Math 446. Alternate years.
449. **Advanced Topics in Analysis. 4 Hours.** May be repeated for credit. Special topics. Prerequisite: Consent of the instructor.
450. **Projective Geometry I. 4 Hours.** Coordinatization, collineation groups, Desargues's condition, weakened forms of Desargues's condition and corresponding coordinate systems, fundamental theorem of projective geometry. Prerequisite: Consent of the instructor. Alternate years.
451. **Projective Geometry II. 4 Hours.** Finite planes, free planes, collineations of division ring planes and of free planes, the Lenz-Bartoli classification. Prerequisite: Math 450. Alternate years.
452. **Differential Geometry I. 4 Hours.** Manifolds, tensor fields, the tensor algebra, the Grassman algebra, exterior differentiation, mappings, transformations of vector fields and differential forms, affine connections, parallelism, the exponential mappings, covariant differentiation. Prerequisite: Consent of the instructor. Alternate years.
453. **Differential Geometry II. 4 Hours.** The Riemannian connection, complete Riemannian manifolds, isometries, curvature, Lie groups. Prerequisite: Math 452. Alternate years.
454. **Structure of Differentiable Manifolds I. 4 Hours.** Tangent bundle, vector fields, tensors, differentiable mappings, geodesics, exponential mapping, Whitney embedding theorem, Morse theory. Prerequisite: Credit or registration in Math 421 and 430. Alternate years.
455. **Structure of Differentiable Manifolds II. 4 Hours.** De Rham theorem, duality, vector bundles, characteristic classes, Hirzebruch index theorem, almost complete structures, Milnor spheres. Prerequisite: Math 454. Alternate years.
456. **Structure of Differentiable Manifolds III. 4 Hours.** Poincaré conjecture, structures on manifolds, cobordism theorem, embeddings and immersions, Atiyah-Singer index theorem, Lie groups and Lie algebras, Bott periodicity theorem. Prerequisite: Math 455.
459. **Advanced Topics in Geometry. 4 Hours.** May be repeated for credit. Special topics. Prerequisite: Consent of the instructor.
460. **Recursion Theory I. 4 Hours.** Same as Philosophy 460. Introduction to the theory of recursive functions, Turing machines, and effective computability. Gödel's incompleteness theorem. Prerequisite: Math 344 or 393 or 395 or consent of the instructor. Alternate years.
461. **Recursion Theory II. 4 Hours.** Same as Philosophy 461. Classification of recursively enumerable sets, Post's problem, degrees of unsolvability, the arithmetical hierarchy. Prerequisite: Math 460. Alternate years.
462. **Metamathematics I. 4 Hours.** Same as Philosophy 462. Classical first order logic, axiomatic theories, model theory. Prerequisite: Math 344. Alternate years.
463. **Metamathematics II. 4 Hours.** Same as Philosophy 463. Incompleteness, undecidability, nondefinability. Prerequisite: Math 462. Alternate years.
464. **Metamathematics III. 4 Hours.** Same as Philosophy 464. Higher order logic, infinitary logic, proof theory. Prerequisite: Math 463. Alternate years.
465. **Advanced Set Theory I. 4 Hours.** Same as Philosophy 465. Axiomatic set theory, consistency of the continuum hypothesis, and the axiom of choice. Prerequisite: Math 344 or 400 or consent of the instructor.
466. **Advanced Set Theory II. 4 Hours.** Same as Philosophy 466. Strong infinity axioms. Independence of continuum hypothesis and the axiom of choice from Zermelo-Fraenkel's axioms. Prerequisite: Math 465. Alternate years.
467. **Model Theory I. 4 Hours.** Introduction to model theory. Compactness theorem, model completeness, Ehrenfeucht's theorem, method of diagrams, two cardinal theorems, indiscernibles. Prerequisite: Math 343 or 462 or consent of the instructor. Alternate years.
468. **Model Theory II. 4 Hours.** Saturated models, categoricity in power, stable theories, rank in model theory, ultraproducts. Prerequisite: Math 467. Alternate years.
469. **Advanced Topics in Mathematical Logic. 4 Hours.** May be repeated for credit. Same as Philosophy 469. Special topics. Prerequisite: Math 344.
470. **Probability Theory I. 4 Hours.** Measure-theoretic aspects of probability theory, characteristic functions, the inversion theorem, the Levy-Cramer continuity theorem, Bochner's theorem, Cramer's theorem and the Herglotz lemma, types of convergence, the Borel-Cantelli lemma, the zero-one law, the law of large numbers, central limit theorems of Lindeberg, Liapunov, and Lindeberg-Feller. Prerequisite: Math 431. Alternate years.
471. **Probability Theory II. 4 Hours.** The central limit problem, conditional probability, martingales, random walk and recurrent events, Markov processes with discrete and continuous parameters, general introduction to processes with independent increments and orthogonal increments, stationary processes, least-square prediction. Prerequisite: Math 470. Alternate years.
472. **Regression Analysis. 4 Hours.** Simple and multiple linear regression. Least-squares theory, Gauss-Markov theorem. Prerequisites: Math 348 and either Math 372 or 359. Alternate years.
473. **Analysis of Variance. 4 Hours.** The analysis of variance and covariance; random-effects models and mixed models; experimental design. Prerequisite: Math 472. Alternate years.



474. Correlation Theory and Elementary Multivariate Analysis. 4 Hours. Algebra of multivariate samples; the multivariate normal distribution; sampling distributions of various estimators. Simple, partial, and multiple correlation. Hotelling's T^2 classification of observation. Prerequisite: Math 472. Alternate years.

477. Advanced Statistical Theory I. 4 Hours. Intensive study of fundamental topics: sampling distributions, sufficient statistics; estimation, tests of statistical hypothesis; large sample theory; general theory of linear statistical models; sequential methods. Prerequisite: Math 372. Alternate years.

478. Advanced Statistical Theory II. 4 Hours. The decision-theoretic approach to mathematical statistics. Admissibility, completeness; invariant statistical decision problems; multiple decision problems; sequential decision problems. Prerequisite: Math 477. Alternate years.

480. Scattering Theory I. 4 Hours. Solutions of the reduced wave equations for scattering of scalar, vector, and dyadic waves; separable and nonseparable problems. Representations: Green's function integrals, complex integrals, inverse distance series, special function series; approximations; geometrical optics and potential theory; applications. Prerequisites: Math 323, 331, Phys 371. Alternate years.

481. Scattering Theory II. 4 Hours. Representations, theorems, and approximations for many-body problems. Multiple scattering solutions as functionals of single-body functions: integral equations, algebraic equations, series representations, operational closed forms, asymptotic forms. Two-scatterer problems, arbitrary configurations, and periodic arrays. Prerequisite: Math 480. Alternate years.

482. Scattering Theory III. 4 Hours. Statistical scattering problems. Scattering by randomly moving distributions. Models for scattering by rough surfaces, gases, and liquids. Relations between scatterer statistics and signal statistics for low-speed distributions. Relativistic scattering problems. Prerequisite: Math 481. Alternate years.

484. Introduction to Applied Analysis I. 4 Hours. Linear vector spaces; introduction to Banach space; contraction mapping theorem; existence and uniqueness theorems for ordinary differential equations; linear ordinary differential equations and systems. Prerequisites: Math 312 and 341 or 348. Alternate years.

485. Introduction to Applied Analysis II. 4 Hours. Pre-Hilbert and Hilbert space; linear symmetric compact operators; Sturm-Liouville theory; minimax principles and completeness of eigenfunctions; linear partial differential equations; Green's functions; applications to electromagnetic theory and continuum mechanics. Prerequisite: Math 484. Alternate years.

486. Physical Principles in Applied Mathematics I. 4 Hours. Development of the techniques and concepts basic to models for physical phenomena including applicable analysis and algebra in a physical context, mathematical description of motion, forms in various coordinate systems, representation of waves, discrete particle mechanics. Prerequisites: Math 312, 323 and 331 or Phys 368. Alternate years.

487. Physical Principles in Applied Mathematics II. 4 Hours. Theory of orbits, oscillatory systems, resonance, Mathieu's equation, Lienard equation, perturbation methods, stability. Calculus of variation and variational formulation of mechanics, theory of conservation laws in the physical sciences. Prerequisite: Math 486. Alternate years.

488. Physical Principles in Applied Mathematics III. 4 Hours. Techniques and concepts used in developing mathematical models of physical phenomena, and investigation of the physical content of mathematical representation of these models in the areas of classical physics, including fluids, elasticity, electrodynamics, statistical mechanics, scattering theory. Prerequisite: Math 487. Alternate years.

489. Advanced Topics in Applied Mathematics. 4 Hours. May be repeated for credit. Special topics. Prerequisite: Consent of the instructor.

490. Combinatorial Algorithms. 4 Hours. Combinatorial and algebraic algorithms for use on a computer, including finite field computation, factoring polynomials, the Todd-Coxeter algorithm, and stabilizer chain algorithm for finite groups. The CAMAC computer system is used in conjunction with this course. Prerequisites: Math 386 or Math 346 and Math 347. Alternate Years.

491. Combinatorial Theory. 4 Hours. Permutations and combinations; incidence algebra and inversion formulas; generating functions; Polya's enumeration theorem; matching theory; Ramsey's theorem; extremal set theory; difference sets; finite geometries; Hadamard matrices; block designs. Prerequisite: Math 345. Alternate years.

492. Numerical Methods in Partial Differential Equations. 4 Hours. Classification of equations and boundary value problems; finite difference analogues for parabolic, hyperbolic, and elliptic equations; explicit methods of parabolic and hyperparabolic systems; the method of characteristics for hyperbolic equations; stability of initial value problems; iterative methods (modern and classical) for elliptic equations; discretization and round-off errors. Prerequisites: Math 323 and 389 or the equivalents.

494. Mathematical Coding. 4 Hours. Perfect codes, self-dual codes, weight distributions; connections between codes and designs, and codes and groups; nonlinear codes and relations to Hadamard matrices and finite geometries; applications and coding. Prerequisites: Math 240 and Math 346 or Math 369. Alternate years.

497. Problem Seminar. 4 Hours. Emphasis on solving mathematical problems requiring techniques from many mathematical disciplines, including real and complex analysis, linear algebra, group theory, differential and integral equations, and variational calculus. Prerequisite: Approval of the department.

498. Practicum in the Doctor of Arts Program. 4 to 8 Hours. Required of all candidates for the Doctor of Arts in Mathematics. May be taken as a two-term sequence for 4 hours each term or as a one-term course for 8 hours of credit. Development of original curricular materials; application of these materials in a teaching situation. Supervision by a specially appointed committee. Prerequisites: Math 427 and 12 hours of Doctor of Arts 402, 404, 406, 408.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Prerequisite: Approval of the department.

PHILOSOPHY

Myles Brand, Chairperson of the Department
Ralf Meerbote, Director of Graduate Studies

Professors: Myles Brand, George T. Dickie, Gerald Dworkin, Arthur I. Fine, Clark Glymour, Daniel Morris, Brian S. Skyrms, Irving Thalberg

Associate Professors: Sandra L. Bartky, Charles H. Chastain, Neal K. Grossman, Paul Guyer, Dorothy Grover, Richard Kraut, Ralf Meerbote, Paul R. Teller, Leslie H. Tharp, W. Kent Wilson

Assistant Professors: Kathleen Cook, Joshua T. Rabinowitz

Lecturers: Daniel P. Berger, Ihru Nahm

The department offers work leading to the Master of Arts and the Doctor of Philosophy.

Admission Requirements

Applicants are considered on an individual basis. They should have completed courses in modern formal logic, ethics, history of philosophy, epistemology, metaphysics, and philosophy of science, but an undergraduate major in philosophy is not required. In addition, applicants must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. In addition, all applicants must submit test scores from the Graduate Record Examination (quantitative and verbal test), three letters of recommendation, preferably from professors who are familiar with the student's recent work, and a 250-word statement concerning past work in philosophy and plans for graduate study. In exceptional cases, students who have averages of less than 4.00 but above 3.75 or whose preparation in philosophy is inadequate may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such students may be admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status.

An applicant interested in a nondegree status must submit transcripts to the department showing that they have a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of study. Admitted students must have their selection of courses approved by the director of graduate studies before registering.

Degree Requirements

Master of Arts

A student must choose at least one course in each of the following areas: the history of philosophy; the theory of knowledge, including logic, philosophy of science, and philosophy of language; and the theory of value, including ethics and esthetics. The department also requires the student to complete a unified program of 48 quarter hours of graduate study under the direction of an adviser. The student must complete 16 quarter hours at the 400 level, of which 8 hours must be in regularly scheduled courses (excluding independent study and thesis research).

Doctor of Philosophy

The candidate must complete at least 144 quarter hours of graduate work beyond the baccalaureate or at least 96 quarter hours beyond the master's. Full-time study (a minimum of 12

hours of course work each quarter) is encouraged but not required.

A student progresses toward the PhD in two stages:

1. Comprehensive written examinations are given early in the spring quarter. Students must take this exam no later than their third year.

There are six exam areas:

- I. Metaphysics and epistemology
- II. Ethics and political and social philosophy
- III. Esthetics
- IV. Philosophy of language
- V. Philosophy of logic, logic, and the philosophy of mathematics
- VI. Philosophy of science

Area I is required. In addition, each student must elect to take two other exams (that is, two exams from II through VI). There is no general history exam, but it is understood that historical questions appear in each of the six designated areas.

2. Within ten weeks after a student successfully completes the comprehensive examination, a prospectus for a dissertation must be presented to the student's thesis committee. The committee then meets with the student to discuss and evaluate the proposal. Only as the outcome of such a meeting can the prospectus be approved. Approval of the prospectus is a requirement for admission to candidacy. A member of the committee is named to supervise the writing of the dissertation. Upon completion of the dissertation, the candidate must defend it in a final oral examination.

In addition to the foregoing, each student must pass an examination in elementary logic, to be taken at the beginning of the first year. Students are also required to take one graduate course in the history of ancient philosophy and one in the history of modern philosophy by the end of their second year.

The language requirement for each student is decided by a department committee of graduate faculty. The determination is based on a consideration of the area in which the student intends to specialize. In no case is proficiency in more than two languages required. In those areas where the primary sources are in English, a foreign language may not be required.

A detailed statement of the special department requirements for graduate students can be obtained from the Department of Philosophy, 1803 University Hall.

Courses for Graduate and Advanced Undergraduate Students

300. Philosophy of Space and Time. 4 Hours. Topics include geometry and space, contingent and necessary properties of space and time, the direction and flow of time, effects preceding their causes, and Zeno's paradoxes. Prerequisite: Two courses in philosophy or consent of the instructor. Grossman, Spring.

301. Plato. 4 Hours. May be repeated once for credit with the approval of the department. Careful reading of selected *Dialogues*; emphasis on Plato's metaphysics and epistemology. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 201 and 236 are recommended.

302. Aristotle. 4 Hours. May be repeated once for credit with the approval of the department. Careful reading of selected works; emphasis on Aristotle's metaphysics and epistemology. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 201 and 236 are recommended. Spring.

303. Chinese Philosophy. 4 Hours. Same as Asian Studies 325. Development of major philosophies. Prerequisite: Two courses in philosophy or junior standing and AsSt 171, 172, 173.

304. Seventeenth-Century Rationalism. 4 Hours. May be repeated for a maximum of 8 hours of credit with the approval of the department. Same as Religious Studies 304. Careful readings of the works of one or more of the rationalist philosophers, such as Descartes, Spinoza, and Leibniz. Prerequisite: Phil 203 or consent of the instructor.

306. British Empiricism. 4 Hours. May be repeated for credit with the approval of the department. Careful reading of the works of one or more of the British Empiricists, such as Locke, Berkeley, and Hume. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 203 and 230 or 236 are recommended. Chastain, Winter.

308. Kant. 4 Hours. Intensive study of Kant's metaphysics and theory of knowledge with the main readings drawn from the *Critique of Pure Reason*. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 203 and 230 or 236 are recommended. Meerbote, Spring.

309. Topics in the History of Ethics. 4 Hours. In-depth study of one person, such as Kant or Sidgwick or one school of thought, such as the natural rights theorists or the utilitarians. Prerequisite: Phil 218.

310. Nineteenth-Century and Early Twentieth-Century Thought. 4 Hours. May be repeated once for credit with the approval of the department. Readings in the works of Hegel, Schelling, Fichte, Schopenhauer, Marx and Engels, J.S. Mill, Nietzsche, McTaggart, Green, Bradley, Peirce, Perry, and others. Prerequisite: Two courses in philosophy or consent of the instructor. Meerbote, Fall.

311. Inductive Logic. 4 Hours. Traditional and contemporary problems of induction. Inductive logic and the theory of probability. Prerequisite: Phil 211 or consent of the instructor.

312. Recent and Contemporary Philosophy: Analysis and Logical Empiricism. 4 Hours. Developments in recent philosophy that have their roots in the study of logic and language, such as logical atomism, positivism, and analytical philosophy. Prerequisite: Two courses in philosophy or consent of the instructor. Fine, Winter.

314. Recent and Contemporary Philosophy: Phenomenology and Existential Philosophy. 4 Hours. Important contributions to the phenomenological movement. Selected readings from Husserl, Heidegger, Jaspers, Sartre, Merleau-Ponty, and others. Prerequisite: One course in philosophy or consent of the instructor. Bartky, Winter.

315. Modern Chinese Philosophy. 4 Hours. Same as Asian Studies 326. Development of recent Chinese systems of philosophy. Prerequisite: Phil 303.

321. Introduction to Formal Logic. 4 Hours. Semantics of first order logic with identity; other topics in mathematical or philosophical logic. Prerequisite: Phil 211 or consent of the instructor. Skyrms, Winter.

322. Problems in the Foundations of Logic and Mathematics. 4 Hours. Survey of selected problems. Prerequisite: Phil 211 or consent of the instructor. Grover, Fall.

330. Topics in Theory of Knowledge. 4 Hours. Intensive treatment of one or more topics, such as the analysis of empirical knowledge claims, the nature of truth, knowledge of other minds, the nature of necessary truths. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 230 is recommended. Meerbote, Spring.

332. Topics in Ethics and Value Theory. 4 Hours. Same as Religious Studies 332. Intensive treatment of one or more topics, such as the analysis of moral judgments, the classification of ethical theories according to their formal properties, the thesis of ethical relativism, and the comparison between ethical and scientific theories. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 216 or 218 is recommended. Rabinowitz, Winter.

334. Esthetics. 4 Hours. Intensive examination of such topics as the esthetic object, form in art, representation, meaning in art, art and knowledge. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 210 or 212 is recommended. Dickie, Spring.

336. Topics in Metaphysics. 4 Hours. Intensive treatment of one or more topics, such as substance and attribute, universals and particulars, free will, human action, the relation between mind and body. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 236 is recommended. Thalberg, Winter.

338. Philosophical Analysis of the Concept of Mind. 4 Hours. Intensive treatment of one or more topics in the philosophy of mind, such as emotions, thoughts, intentions, and the will. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 215 is recommended. Berger, Fall.

340. Topics in the Philosophy of Language. 4 Hours. Intensive treatment of one or more topics, such as meaning, reference, and the structure of language. Prerequisite: Phil 211 or a 300-level logic course or consent of the instructor. Philosophy 240 is recommended.

W. Wilson, Winter.

341. Philosophical Problems in the Social Sciences. 4 Hours. Critical examination of some important philosophical problems in the foundations of the social sciences: general methodological problems or specific philosophical problems arising from some specific theories, such as decision theory, theory of learning, information theory, or other theories. Exact content varies from year to year. Prerequisite: Two courses in philosophy or consent of the instructor. Spring.

343. Formal Logic I. 4 Hours, Graduate; 3 Hours, Undergraduate. Same as Mathematics 343. Propositional logic, logic of quantifiers, and identity and completeness. Prerequisite: Consent of the instructor; none for mathematics majors.

344. Formal Logic II. 4 Hours, Graduate; 3 Hours, Undergraduate. Same as Mathematics 344. Continues Philosophy 343. Mathematical analysis of decidability and computability. Arithmetization of syntax. Incompleteness and undefinability theorems. Introduction to axiomatic set theory. Prerequisite: Phil 343.

345. Philosophical Problems of the Sciences. 4 Hours. May be repeated for credit with the approval of the department. Reading and discussion of selected works on the aims and methods of science, the status of scientific theories, natural laws and theoretical entities, and the nature of explanation. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 222 is recommended. Skyrms, Fall.

347. Philosophy of Law. 4 Hours. Intensive treatment of one or more topics, such as systems of criminal and civil laws, distinction between legislation and judicial decision-making, moral sources, justification of statutes and decisions, criminal and civil responsibility, *mens rea*, theories of punishment, civil disobedience, human rights and civil rights, civil liberties. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 216 or 218 is recommended. Dworkin, Fall.

351. Problems in the Philosophy of Mathematics. 4 Hours. Intensive study of a particular problem or nexus of problems. The problems vary from term to term. Prerequisite: 8 hours of either mathematics or logic.

371. Studies in the Oral Tradition of Native Americans. 4 Hours. Same as English 371, Native American Studies 371, and Religious Studies 371. Content, cultural context, and functions of oral traditions. Styles and performances. Specific topics are announced each term. Prerequisite: Junior standing or Phil 275.

398. Senior Seminar. 4 Hours. Individual research projects are reported to the seminar. Students who intend to do graduate work in philosophy are expected to take this course. Prerequisites: Senior standing, Phil 201, 203, 211, and at least one 300-level course. Brand, Fall.

399. Independent Study. 1 to 8 Hours. Independent study, under the supervision of a staff member, of a topic not covered in the regular curriculum. The course is offered at the request of the student and only at the discretion of the staff members concerned. Prerequisite: Consent of the instructor.

Courses for Graduate Students

401. Seminar: Topics in Ancient Philosophy. 6 Hours. May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive study of selected topics. Kraut, Fall.

405. Seminar: Topics in Modern Philosophy. 6 Hours. May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive analysis of the work of one important philosopher or philosophical movement between 1600 and 1900.

407. Seminar: Topics in Contemporary Philosophy. 6 Hours. May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive analysis of the work of one important philosopher or philosophical movement of the twentieth century. Economos, Grossman, Winter.

411. Seminar on Recent Ethical Theory. 6 Hours. May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive study of selected topics. Dworkin, Winter.

413. Seminar on Philosophical Topics in Logic. 6 Hours. May be

repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Grover, Spring.

415. **Seminar on Metaphysics. 6 Hours.** May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive study of selected topics. D. Berger, Brand, Winter, Spring.

417. **Seminar on the Philosophy of Science. 6 Hours.** May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive study of selected topics. Teller, Fall. Skyrms, Winter. Fine, Spring.

419. **Seminar on the Philosophy of Language. 6 Hours.** May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive study of selected topics. Chastain, Spring.

421. **Seminar on the Theory of Knowledge. 6 Hours.** May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Selected topics in the contemporary theory of knowledge. Thalberg, Fall.

423. **Seminar on Esthetics. 6 Hours.** May be repeated for credit with the approval of the department. Two sections may be taken concurrently when topics vary. Intensive study of selected topics.

460. **Recursion Theory I. 4 Hours.** Same as Mathematics 460. Introduction to the theory of recursive functions, Turing machines, and effective computability. Godel's incompleteness theorem. Prerequisite: Phil 344 or Math 393 or 395 or consent of the instructor.

461. **Recursion Theory II. 4 Hours.** Same as Mathematics 461. Classification of recursively enumerable sets, Post's problem, degrees of unsolvability, the arithmetical hierarchy. Prerequisite: Phil 460.

462. **Metamathematics I. 4 Hours.** Same as Mathematics 462. Classical first order logic, axiomatic theories, model theory. Prerequisite: Phil 344.

463. **Metamathematics II. 4 Hours.** Same as Mathematics 463. Incompleteness, undecidability, nondefinability. Prerequisite: Phil 462.

464. **Metamathematics III. 4 Hours.** Same as Mathematics 464. Higher order logic, infinitary logic, proof theory. Prerequisite: Phil 463.

465. **Advanced Set Theory I. 4 Hours.** Same as Mathematics 465. Axiomatic set theory, consistency of the continuum hypothesis, and the axiom of choice. Prerequisite: Phil 344 or Math 400 or consent of the instructor.

466. **Advanced Set Theory II. 4 Hours.** Same as Mathematics 466. Strong infinity axioms. Independence of the continuum hypothesis and the axiom of choice from Zermelo-Fraenkel's axioms. Prerequisite: Phil 465.

469. **Advanced Topics in Mathematical Logic. 4 Hours.** May be repeated for credit. Same as Mathematics 469. Special topics. Prerequisite: Phil 344.

479. **Seminar: Theoretical, Historical, and Philosophical Issues in Psychology. 2 Hours.** Same as History 479 and Psychology 479. May be repeated. Systematic review of special topics; emphasis on current approaches and interpretations. Prerequisite: Consent of the instructor.

483. **Independent Study. 2 to 8 Hours.** Topics and plan of study must be approved by the candidate's adviser and by the staff member who directs the work.

499. **Thesis Research. 0 to 16 Hours.** May be repeated for credit.

PHYSICAL EDUCATION

Leo L. Gedvilas, Acting Head of the Department
Marian E. Kneer, Director of Graduate Studies

Professors: Sheldon L. Fordham, Helen M. Heitmann, Lawrence B. Oscai

Associate Professors: Marian E. Kneer, Wilma Pesavento, Thomas Sattler

Assistant Professors: Robert J. Beck, Robert A. Hickson, Carol Ann Leaf, Warren K. Palmer

The Department of Physical Education in the College of Health, Physical Education, and Recreation offers the Master of Science in Physical Education to prepare advanced students for professional careers. The program has four areas of specialization: administration of physical education and sports, psychomotor learning, exercise physiology, and physical education for the atypical.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours of undergraduate study and a grade point average of at least 4.00 for all graduate work. Applicants also must present at least 30 quarter hours of undergraduate work in physical education. Applicants who have undergraduate averages above 3.75 but below 4.00 for the last 90 hours of undergraduate study or who do not have an adequate background in physical education may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such applicants will be admitted on limited status and will be required to remedy deficiencies before being admitted to regular status.

Applicants who have majored in fields other than physical education are encouraged to consult the department prior to making formal applications for admission. All students who apply for admission must submit the following:

1. A completed application form.
2. Complete transcripts of undergraduate (and any graduate) work.
3. Three letters of recommendation, preferably from former professors or professional supervisors.
4. Graduate Record Examination scores for the aptitude test.

The department accepts applications for nondegree admission. Applicants must have a baccalaureate from an accredited college or university and submit a completed application form.

Degree Requirements

1. A minimum of 48 quarter hours of approved graduate work is required, including 12 hours of a required core of courses, 12 hours of specialization course work, 12 hours of cognate courses that complement the specialization, and 12 hours of physical education elective courses.

2. A minimum of 24 hours must be physical education courses and a minimum of 24 hours must represent the area of specialization (the required core is included in the specialization area total).

3. A minimum of 16 quarter hours must be at the 400 level; 12 of these must be in physical education specialization courses.

4. A minimum of 32 quarter hours must be in course work from the University of Illinois at Chicago Circle.

Required Core: 12 quarter hours are required in all spe-

cializations, distributed as follows:

Physical Education 482 or 490

Physical Education 497 or 498 or 499

Electives: 12 quarter hours in physical education courses.

Cognate Courses: 12 quarter hours, to be in fields related to the area of specialization.

In addition, the following course work is required for each specialization.

Administration of Physical Education and Sport: Physical Education 300, 313 and Physical Education 401 or 405

Psychomotor Learning: Physical Education 313, 314, and any one of Physical Education 312 or 317 or 405 or 411 or 460

Exercise Physiology: Physical Education 321, 426, 427

Physical Education for the Atypical: Physical Education 360, 362, 460

Courses for Graduate and Advanced Undergraduate Students

300. Administrative Theory and Practice in Physical Education. 4 Hours. A theoretical approach to the development of administrative thought as it relates to physical education; emphasis on the understanding of concepts and models from the social sciences and their implications for leadership in the educational setting; development of a personal philosophy of administration. Prerequisite: PE 281. Staff, Fall.

312. Psychology and Physical Activity. 4 Hours. The study and application of psychological concepts concerning perceptual-motor development, emotions, motivation, motor learning, and group dynamics in the physical education process. Prerequisites: Senior standing and PE 278. Kneer, Winter.

314. Motor Learning. 4 Hours. Principles and practice of motor-learning processes and their interaction with the learner and task. Emphasis on understanding feedback loops, motor-learning models, and practice conditions. Prerequisite: PE 278 or the equivalent or consent of the instructor. Kneer, Fall.

321. Applied Research in Exercise Physiology. 4 Hours. The background and developments relative to the cardiac, metabolic, and neuromuscular effects of physical activity; application to specific issues relating to physical activity. Prerequisite: PE 254. Hickson, Winter.

325. Circulation Physiology. 4 Hours. Same as Biological Sciences 376. In-depth discussion of the functional role and control of the heart, blood, major vessels, microcirculation in the vertebrate body. Prerequisite: BioS 275 or 363. Biological Sciences Staff.

328. Advanced Kinesiology. 4 Hours. Mechanics of human motion through the scientific study and application of selected physical principles. Prerequisite: PE 253. Sattler, Spring.

331. Problems and Trends in Urban Recreation. 4 Hours. Identifying and collecting information for a better understanding of the major problems and issues in urban recreation and leisure science. Prerequisite: Baccalaureate or senior standing and consent of the instructor. Sattler, Winter.

333. Evaluation Techniques in Recreation. 4 Hours. Research in the field of recreation; methods and techniques in determining needs and interests for urban recreation and leisure services. Prerequisite: Baccalaureate or senior standing and consent of the instructor. Sattler, Summer.

351. Evaluation in Physical Education. 4 Hours. The availability and value of evaluative tools in physical education; methods for administration of evaluative techniques; analysis of interpretation and use of the results from evaluative techniques; description of the construction of new evaluative instruments employed in physical education. Prerequisite: PE 251. Staff, Fall.

360. Adapted Physical Education Programs. 4 Hours. Organization and administration; content selection, screening techniques, and instructional design with application of kinesiological, sociological, and psychological principles to the needs of atypical students. Prerequisite: PE 253. Beck, Fall.

362. Synthesis of Human Movement Concepts. 4 Hours. Integration of selected concepts from biomechanics, exercise physiology, psychology, and sociology as they apply to the development of meaningful human movement. Prerequisites: Senior standing and consent of the instructor. Staff, Spring.

370. Philosophy of Physical Education. 4 Hours. Historical development of the philosophies of physical education and the assumptions on which current professional philosophies rest. Theory of knowledge in physical education. Pesavento, Spring.

371. Sport and Play of America. 4 Hours. The creation, importation, and derivation of sport and play in America; course of development and adaptation to the nature of American life; impact of the political, economic, cultural, and geographical factors on the character of sport and play. Special emphasis on sport and play in urban America. Prerequisite: PE 252. Pesavento, Winter.

372. Sport and Play in Antiquity. 4 Hours. Sport and play in the cultural life of ancient civilizations prior to the Teutonic invasions. Pesavento, Fall.

373. Sport and Play of the Native American. 4 Hours. Feats and games in the cultural life of the North American Indian prior to the twentieth century. Pesavento, Winter.

381. Workshop in Physical Education. 2 to 4 Hours. May be repeated for credit under different topics. Intensified study of selected activities, topics, processes, or areas. Topics are announced. Staff, Fall, Winter, Spring, Summer.

385. Special Projects in Physical Education. 2 to 4 Hours. Independent research on special projects. Prerequisite: Approval of the student's project by a graduate faculty member. Kneer, Fall, Winter, Spring, Summer.

Courses for Graduate Students

401. Administration of Athletic Programs. 4 Hours. The organization and administration of both men's and women's divisions of interscholastic and intercollegiate athletic programs. Fordham, Spring.

405. Supervision of the Physical Education Program. 4 Hours. Theory, practices, and processes for effective supervision of the teaching-learning environment in physical education. Prerequisite: PE 278 or consent of the instructor. Heitmann, Winter.

411. Differentiated Learning Environments. 4 Hours. Synthesis of theory in teaching behavior, physical education pedagogy, and motor learning; design of differentiated teaching-learning practices and approaches; unique needs of individuals in the acquisition of psychomotor skills. Prerequisites: PE 314 or consent of the instructor. Kneer, Spring.

Spring.

426. Experimental Exercise Physiology. 4 Hours. In-depth discussion of laboratory procedures used in basic research involving experimental animals to measure organ and/or body function. Prerequisite: PE 321. Palmer, Summer.

427. Theory and Methods of Stress Testing. 4 Hours. Analysis of health problems of the cardiovascular systems. Theory, procedures, and techniques utilized by the exercise technician when dealing with graded exercise stress testing in the area of cardiovascular fitness evaluation. Prerequisite: PE 321 or consent of the instructor. Palmer, Fall.

431. Leisure in the Urban Community. 4 Hours. Readings and research in leisure concepts, the urban environment, and the interrelationship for urban leisure service. Prerequisite: Knowledge of research techniques. Sattler, Spring.

460. Perceptual-Motor Learning. 4 Hours. The function of motor activity in the development of the perceptual-motor process. Theories and interpretations of research relating to human processing of sensory information with emphasis on gross motor activity. Lecture and laboratory-discussion. Prerequisite: Psch 360 or Ed 328. Heitmann, Fall.

482. Issues and Problems in Physical Education. 4 Hours. May be repeated once for credit. Intensive study of selected topics; particular attention to current issues and research literature in physical education administration, exercise physiology, curriculum and instruction, physical education for the atypical, recreation, and the psychology and sociology of sport. Specific topics are announced

each term. Prerequisite: 30 hours of physical education. Kneer, Spring.

490. Research in Physical Education. 4 Hours. Intensive training in research methods; particular emphasis on research methodology in physical education. A research paper is required. Prerequisite: 30 hours of physical education. Leaf, Winter.

497. Practicum in Physical Education. 4 to 8 Hours. Credit is not given for Physical Education 497 if the student has credit in 498. Normally open to candidates in the curriculum and instruction or physical education for the atypical areas of specialization. Supervised practicum in a laboratory or field setting in which recent research findings are applied, tested, and evaluated. An extended report is required. Prerequisites: PE 482, completion of course work in the area of specialization, and consent of the adviser and the director of graduate studies. Staff, Fall, Winter, Spring, Summer.

498. Internship in Physical Education. 4 to 8 Hours. Credit is not given for Physical Education 498 if the student has credit in 497. Normally open only to candidates in the administration, exercise physiology, and physical education for the atypical areas of specialization. Supervised internship in a laboratory or field setting. An extended report is required. Prerequisites: PE 482, completion of course work in the area of specialization, and consent of the adviser and the director of graduate studies. Staff, Fall, Winter, Spring, Summer.

499. Thesis. 0 to 16 Hours. May be repeated for credit. Thesis work under the supervision of a graduate adviser. Prerequisites: PE 490 and consent of the graduate adviser. Staff, Fall, Winter, Spring, Summer.

PHYSICS

Paul M. Raccah, Head of the Department
James S. Kouvel, Director of Graduate Studies

Professors: Stanley Aks, Arnold R. Bodmer, James W. Garland, R. Thomas Hawkins (Visiting), James S. Kouvel, Stephan J. Krieger, Donald W. McLeod, Edward B. McNeil, Antonio Pagnamenta, Paul M. Raccah, Charles K. Rhodes, Ram R. Sharma, Swaminatha Sundaram, David J. Vezzetti, Herman B. Weissman, Lester Winsberg.

Associate Professors: Larry L. Abels, Robert J. Abrams, Richard A. Carhart, Helmut Claus, Alan S. Edelstein, Howard S. Goldberg, Gloria A. Hoff, Arthur L. Licht, Seymour Margulies, William J. Otting, John N. Pappademos, David S. Schreiber, Julius Solomon

Assistant Professors: Vincent J. Tekippe

The department offers work leading to the Master of Science and the Doctor of Arts and to the Doctor of Philosophy with the following areas of specialization

Atomic and Molecular Physics—oscillator strengths, vibrational and rotational spectra, high temperature properties, lasers, vacuum UV, astrophysics.

Condensed Matter Physics—magnetic resonance and static susceptibility, specific heat, electron tunneling and transport properties of metals, superconductors, and insulators; studies at ultra-low temperatures; study of semiconductors and ferroelectrics by modulation spectroscopy, study of critical phenomena by light scattering; neutron diffraction experiments at Argonne National Laboratory.

Environmental Physics—mathematical modeling: fluid flow, thermodynamics, and diffusion of materials in the environment

High Energy Physics—experiments at Fermilab, multi-particle spectrometer, high transverse momenta, jets; theoretical research in strong, electromagnetic, and weak interactions; radiation physics.

Laser Physics—molecular energy transfer and kinetics; nonlinear spectroscopy from vacuum UV to far IR; multi-photon processes; frequency conversion and improvements of existing lasers; development of new coherent light sources.

Medical Physics—radiation dosimetry, ultrasonic scattering, and characterization of biological tissues.

Nuclear Physics—nuclear structure, hypernuclei, nuclear potentials, deformed nuclei.

Theoretical Physics—atomic-molecular energies; superconductivity, dispersion relations, lattice properties, electron phonon interactions, crystal fields, quantum hydrodynamics; nuclear structure and hypernuclei; field theory, particle interactions, resonances and scattering; statistical mechanics, astrophysics.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, a grade point average of at least 3.75 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study, and at least 30 quarter hours of courses in physics beyond the level of general physics, including Physics 301, 302, 321, and 341 or their equivalents. Students who have majored in fields other than physics may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such students will be required to take the necessary undergraduate courses without credit in order to prepare themselves for successful participation in the program. Complete transcripts of undergraduate (and any graduate) work must be submitted.

The department will accept applications for nondegree status. Applicants may have to show adequate preparation to enroll in desired courses. Therefore, beyond the Graduate College minimum requirements for nondegree admission (p. 31), applicants are urged to speak with the director of graduate studies.

Each student is assigned a department adviser who assists in selecting an appropriate program of course work and insures that all degree requirements are met.

Degree Requirements

Master of Science

The general requirement for the Master of Science is satisfactory completion of a minimum of 48 quarter hours of course work in courses approved by the department. Each master's candidate must show proficiency in mechanics, electromagnetic theory, quantum mechanics, and thermal physics at the level of Physics 343, 303, 322, and 362, which are described in this bulletin. Such proficiency may be demonstrated either by a satisfactory grade on the placement examination or by satisfactory grades in the above courses. The 48 hours must include Physics 411, 412, and 413 and two sequences of courses from a list of sequences approved by the department. These sequences are designed to give the student a strong background in an area of physics in which there are professional opportunities for holders of the degree, e.g., solid state physics, physics teaching, optical physics, atomic-molecular physics.

For students who intend to continue to the PhD, the requirement of two sequences does not apply. These students must include in their program of study Physics 401, 402, 411, 412, 413, and 441.

In either case, a thesis is optional and, if elected, may be counted up to 12 hours. No more than 12 hours of Physics

497 may be counted toward the degree.

Doctor of Arts

Students must satisfactorily complete at least 144 quarter hours of course work in courses approved by the department. These must include:

1. 48 quarter hours of course work beyond the baccalaureate in physics, including Physics 323, 331, 362, 401, 402, 411, 412, 441, and 461
2. 20 quarter hours in educational methods and techniques, including Physics 451, 452, and Doctor of Arts 406 and at least one of the following: Physics 453, Doctor of Arts 402, 404, 408
3. 32 quarter hours of electives
4. Successful completion of supervised practicum in science teaching (4 quarter hours)
5. 16 quarter hours of thesis work on an approved research topic in physics
6. Completion of at least 24 quarter hours of thesis work on an approved topic in science education

In addition, the student must (1) satisfactorily demonstrate teaching ability before an examining committee, (2) have a satisfactory preliminary examination (similar to the PhD preliminary examination), (3) have a satisfactory major area oral examination, and (4) have a satisfactory defense of the doctoral thesis.

Doctor of Philosophy

The minimum requirements for the PhD are: (1) satisfactory completion of 144 quarter hours of course work approved by the department, including Physics 411, 412, 413, 414, 401, 402, 403, 441, and 461; at least 80 of these hours must be in courses other than Physics 499; (2) a satisfactory preliminary examination on course work at the senior and first-year graduate level (this examination is taken before the completion of two full years of course work and may be repeated once); (3) a satisfactory examination in the student's major area (this examination is taken after completion of a substantial fraction of the course work while the student is in the early stages of thesis research); (4) a satisfactory examination on the student's dissertation. Details concerning all examinations may be obtained from the department office.

Courses for Graduate and Advanced Undergraduate Students

301. Electricity and Magnetism I. 4 Hours. Credit is not given to graduate physics majors. Vector calculus; electrostatic potential and fields in vacuum and material media; energy concepts; boundary value problems. Prerequisites: Phys 143, Math 220. Fall.

302. Electricity and Magnetism II. 4 Hours. Credit is not given to graduate physics majors. Magnetostatics; vector potential; magnetic materials; time-varying fields and electromagnetic induction; Maxwell's equations. Prerequisite: Phys 301. Winter.

303. Electricity and Magnetism III. 4 Hours. Propagation of electromagnetic waves; reflection, refraction, and dispersion; guided waves; radiation; selected topics. Prerequisite: Phys 302. Spring.

304. Electronics I. 4 Hours. Theory of electronic devices, linear and nonlinear analysis, applications of vacuum and semiconductor devices to circuits, amplifiers, biasing, feedback, oscillators, and special circuits. Prerequisite: Phys 143. Fall.

305. Electronics II. 4 Hours. Pulse-shaping networks, logic circuits, control circuits, distributed amplifiers, special problems of transducers, special signal-to-noise techniques. Prerequisite: Phys 304. Winter.

321. Quantum Mechanics I. 4 Hours. The basic theory of the mechanics governing microscopic systems. Wave functions; probability density; operators; the Schrodinger equation with examples in one

and three dimensions. Prerequisites: Phys 244, Math 220. Credit or registration in Mathematics 310 is recommended. Winter.

322. Quantum Mechanics II. 4 Hours. Mathematical structure of quantum mechanics; observables for a quantum state; angular momentum; perturbation theory; the Born approximation; the variational method; transition probabilities. Prerequisite: Phys 321. Credit or registration in Mathematics 311 is recommended. Spring.

323. Elementary Solid State Physics. 4 Hours. Individual projects are required. Crystal structure, thermal and dielectric properties of solids, free electron model of metals, band theory, semiconductor physics, dislocations and strength of solids. Prerequisite: Phys 322. Spring.

331. Nuclear Physics. 4 Hours. Principal properties of nucleons and nuclei: sizes, shapes, energies, stability, decays, reactions, and fission. Nuclear forces: the deuteron; nucleon-nucleon scattering; charge independence. Nuclear structure: spectra; shell and collective models. Nuclear reactions: the compound nucleus and direct reactions. Prerequisite: Phys 322 or approval of the department. Spring.

341. Theoretical Mechanics I. 4 Hours. Credit is not given to graduate physics majors. Individual projects are required. Motion of a particle in one, two, and three dimensions; Kepler's laws and planetary motion, scattering of particles, conversion between laboratory and center of mass coordinate systems, conservation laws, motion of a rigid body in two dimensions. Prerequisites: Phys 142, Math 220. Fall.

342. Theoretical Mechanics II. 4 Hours. Individual projects are required. Statics of extended systems, moving coordinate frames, fictitious forces and conservation laws, special theory of relativity, mechanics of continuous media. Prerequisite: Phys 341. Winter.

343. Theoretical Mechanics III. 4 Hours. Individual projects are required. Rigid-body motion in three dimensions, motion in gravitational fields, generalized coordinates and Lagrange and Hamilton equations, equations of constraint, small-vibration theory. Prerequisite: Phys 342. Spring.

361. Thermodynamics. 4 Hours. Thermodynamic variables, equilibrium, zeroth law of thermodynamics, isolated systems, the first law, Kelvin and Clausius statements of second law, Clausius inequality, irreversible processes, thermodynamic potentials, Maxwell relations, stability criteria, equations of state, Clausius-Clapeyron equation, multicomponent systems, the third law, selected applications to physical systems. Prerequisite: Phys 246. Fall.

362. Statistical Physics. 4 Hours. Kinetic theory of dilute gases, elementary statistical concepts, equilibrium between interacting systems; temperature, entropy, statistical calculation of thermodynamic quantities, the microcanonical and canonical ensembles, quantum statistics of ideal gases, selected applications to physical systems. Prerequisite: Phys 361. Winter.

366. Introduction to the Mathematical Methods of Theoretical Physics I. 4 Hours. Same as Mathematics 366. The traditional mathematical methods of theoretical physics from an intuitive point of view. Applications of problem-solving in electrostatics and classical and quantum mechanics. Matrices and linear transformations, Fourier analysis, the partial differential equations of physics, and Sturm-Liouville theory. Introduction to special functions frequently encountered in physics. Prerequisites: Math 220, 310. Winter.

367. Introduction to the Mathematical Methods of Theoretical Physics II. 4 Hours. Same as Mathematics 367. The traditional mathematical methods of theoretical physics from an intuitive point of view. Applications to problem-solving in electrostatics, electrodynamics, and classical and quantum mechanics. The special functions frequently encountered in physics and their use in the solution of boundary value problems, power series solutions, Green's functions, contour integral representations, and additional uses. Prerequisite: Phys 366. Spring.

371. Light (Wave Optics). 4 Hours, Lecture and Laboratory; 2 Hours, Lecture Only. Wave propagation and Maxwell's equations, interference and interferometers, gratings, circular aperture, echelon, resolving power. Prerequisites: Phys 245 and credit or registration in Math 220. Spring.

381. Modern Experimental Physics I. 4 Hours, Lecture and Laboratory; 1 Hour, Lecture Only. Techniques and experiments in the physics of atoms, atomic nuclei, molecules, the solid state, and other areas of modern physical research. Prerequisite: Phys 304. Winter.

382. Modern Experimental Physics II. 4 Hours. Continues Physics 381. Lecture and laboratory. Prerequisite: Phys 381. Spring.

391. **Physics Seminar. 1 Hours.** May be repeated for a maximum of 4 hours of credit. Satisfactory/unsatisfactory grade only. Preparation and presentation by students of talks on topics of current interest in physics. Prerequisite: Graduate or senior standing. Fall, Winter, Spring.

392. **Physics Research. 2 to 4 Hours.** Graduate students receive satisfactory/unsatisfactory grade only. Research under the close supervision of a faculty member. Prerequisites: Senior standing and approval of the department. Fall, Winter, Spring.

393. **Special Problems. 2 to 4 Hours.** Graduate students receive satisfactory/unsatisfactory grade only. Special problems or reading in modern physics under individual arrangement with a faculty member. Prerequisites: Senior standing and consent of the instructor. Fall, Winter, Spring.

Courses for Graduate Students

401. **Electrodynamics I. 4 Hours.** Maxwell's equations; static and time-dependent fields; boundary value problems; wave propagation. Prerequisite: Phys 303 or approval of the department. Fall.

402. **Electrodynamics II. 4 Hours.** Classical theory of radiation; radiation reaction; special relativity; covariant formulation of electrodynamics. Prerequisite: Phys 401 or approval of the department. Winter.

403. **Electrodynamics III. 4 Hours.** Lagrangian formulation of electrodynamics; action principles; special topics in electromagnetic theory. Prerequisite: Phys 402 or approval of the department. Spring.

411. **Quantum Mechanics I. 4 Hours.** Wave functions, uncertainty principle and Schrodinger equation, one- and three-dimensional one-particle problems, approximate methods. Prerequisite: Phys 322 or approval of the department. Fall.

412. **Quantum Mechanics II. 4 Hours.** Operators and Hilbert space formulation, symmetries and conservation laws, angular momentum and rotations, coupling and angular momenta, spherical tensors, scattering, phase shifts, Born series, scattering in Coulomb field, inelastic scattering. Prerequisite: Phys 411 or approval of the department. Winter.

413. **Quantum Mechanics III. 4 Hours.** Introduction to formal theory of scattering, S-matrix, time-dependent and independent formulations of scattering, introduction to relativistic quantum mechanics, Klein-Gordon and Dirac equations, introduction to quantum field theory, electromagnetic transitions, particles and antiparticles. Prerequisite: Phys 412 or approval of the department. Spring.

414. **Advanced Quantum Mechanics I. 4 Hours.** Classical theory of particles and fields. Quantum theory of radiation: quantization, emission, absorption and scattering of photons, dispersion relations, Lamb shift. Relativistic theory of Spin-1/2 particles; Dirac equation, the hydrogen atom, particles and antiparticles, weak interactions, neutrinos. Introduction to covariant perturbation theory. Prerequisite: Phys 413 or approval of the department. Fall.

415. **Advanced Quantum Mechanics II. 4 Hours.** Interacting quantum fields, the S-matrix, the Dyson expansion and diagrams, applications to problems in quantum electrodynamics, renormalization and its physical interpretation. Prerequisite: Phys 414 or approval of the department. Winter.

416. **Advanced Quantum Mechanics III. 4 Hours.** Bethe-salpeter equation; reduction formulas; S-matrix elements in terms of Green's functions; dispersion relations and applications to vertex functions and scattering amplitudes; current algebras; operator product theory; applications to strong, weak, and electromagnetic interactions. Prerequisite: Phys 415 or approval of the department. Spring.

417. **Many-Body Theory I. 4 Hours.** Quantum theory of many-particle systems at zero temperature; molecular and self-consistent fields; canonical transformations; the quasiparticle; Green's functions; perturbation theory; Feynmann diagrams; simple applications to Fermi and Bose systems. Prerequisites: Phys 414, 461. Winter.

418. **Many-Body Theory II. 4 Hours.** Functional integral formalism; elementary excitations and physical interpretation of Green's functions; Landau theory; thermal Green's functions and finite temperature perturbation theory; reaction matrix methods; applications to Fermi and Bose systems. Prerequisite: Phys 417. Spring.

421. **Atomic and Molecular Physics I. 4 Hours.** Hydrogen atom and one-electron systems, helium atom, self-consistent field theory, alkali

spectra, vector model, Zeeman and Stark effects, fine and hyperfine structure, collisions, ionization. Prerequisite: Phys 322 or approval of the department. Fall.

422. **Atomic and Molecular Physics II. 4 Hours.** Rotation and vibrational energies of diatomic molecules, potential curves, electronic transitions and transition moments, intensities, thermodynamic properties, applications. Prerequisite: Phys 322 or approval of the department. Winter.

423. **Atomic and Molecular Physics III. 4 Hours.** Structure and symmetry of molecules, vibrational and rotational spectra, experimental infrared and Raman spectra, chemical bonding, molecular interactions, molecular collisions, intermolecular potentials, relaxation phenomena. Prerequisite: Phys 322 or approval of the department. Spring.

424. **Symmetry Principles in Molecular and Solid State Physics. 4 Hours.** Concepts of symmetry. Point groups, space groups. Representations. Normal modes and symmetry coordinates. Applications to molecular systems, including centrifugal and thermal amplitudes. Crystal spectra. Symmetry of atomic terms. Crystal fields. Vibronic transitions. Double groups. Applications of symmetry to band structures in solids. Prerequisite: Phys 412 or approval of the department.

425. **Solid State Physics I. 4 Hours.** Crystal structure, X-ray methods, crystal forces, lattice theory, vibrations, heat conductivity. Prerequisite: Phys 323 or approval of the department. Fall.

426. **Solid State Physics II. 4 Hours.** Electric and magnetic properties of solids, free-electron model of metals, quantum statistics, band theory, order-disorder theory. Prerequisite: Phys 425 or approval of the department. Winter.

427. **Solid State Physics III. 4 Hours.** Semiconductors, ferromagnetism and antiferromagnetism, superconductivity, lattice vacancies, color centers, excitons, luminescence. Prerequisite: Phys 426 or approval of the department. Spring.

428. **Quantum Theory of Solids I. 4 Hours.** Introduction to quantum mechanics of noninteracting particles in a periodic potential, band structure of solids, optical properties of solids, dynamics of electrons in a magnetic field and a crystal potential. Prerequisites: Phys 412, 427, and 461 or approval of the department. Fall.

429. **Quantum Theory of Solids II. 4 Hours.** The electron-phonon interaction, collective excitations in solids, phonons, plasmons, polarons, magnons, excitons, quasiparticles, Landau theory of the Fermi liquid, the Hartree-Fock, RPA, and SCF approximations, generalized susceptibility, introduction to Green's functions, and diagrammatic techniques in solids. Prerequisite: Phys 428 or approval of the department. Winter.

430. **Quantum Theory of Solids III. 4 Hours.** May be repeated for credit by arrangement with the department. Topics vary from year to year. Special topics in the modern theory of solids, superconductivity, ferromagnetism, liquid helium, theory of alloys, theory of liquids, theory of defects in semiconductors, applications of group theory to solid state physics, and others. Prerequisite: Phys 429 or approval of the department. Spring.

431. **Elementary Particle and Nuclear Physics I. 4 Hours.** Two-nucleon system: properties of the deuteron, nucleon-nucleon scattering, nuclear forces. Properties of pions and pion-nucleon scattering, other nonstrange mesons; introduction to strange particles and higher symmetries. Prerequisite: Phys 412 or approval of the department.

432. **Elementary Particle and Nuclear Physics II. 4 Hours.** General properties of nuclei: sizes, binding energies, stability, saturation. Introduction to nuclear models and structure. Beta decay and weak interactions. Prerequisite: Phys 431 or approval of the department.

433. **Nuclear Physics I. 4 Hours.** Review of two-nucleon system and nuclear forces, nuclear models and nuclear spectroscopy. Individual-particle model, collective model, particle-hole excitations, pairing, electromagnetic interactions. Prerequisites: Phys 413 and 432 or approval of the department. Winter.

434. **Nuclear Physics II. 4 Hours.** Nuclear reactions: compound nucleus, optical model, direct reactions. Nuclear forces and nuclear structure; light nuclei, nuclear many-body problem; nucleon-nucleus scattering at high energies. Interactions of particles other than nucleons with nuclei. Prerequisite: Phys 433 or approval of the department.

435. **Elementary Particle Physics I. 4 Hours.** Fields and invariance principles, relativistic kinematics and scattering, strong and electro-

magnetic interactions of nonstrange particles. Pions and nucleons, resonances, introduction to dispersion relations, one-particle exchanges, electromagnetic form factors. Prerequisites: Phys 413 and 432 or approval of the department. Winter.

436. Elementary Particle Physics II. 4 Hours. Strong interactions of strange particles, higher symmetries; weak interactions of nonstrange and strange particles. Prerequisite: Phys 435 or approval of the department. Spring.

441. Classical Mechanics, 4 Hours. Variational principles; Lagrange and Hamilton equations; Hamilton-Jacobi theory; rigid body motion; small oscillations; continuous systems and fields. Prerequisite: Phys 343 or approval of the department. Fall.

445. Introduction to General Relativity. 4 Hours. Deficiencies of Newtonian gravitational theory, principle of equivalence, the metric field and geodesics, tensor analysis and differential geometry, Einstein's equations and the action principle, the energy-momentum pseudotensor, gravitational fields and waves. Prerequisites: Phys 402 and 441 or approval of the department.

451. Physics Teaching I. 4 Hours. Seminars on various methods and approaches to classroom teaching at different college levels. Individual student design and construction of a classroom demonstration. Supervised practice teaching in the physics classroom. Prerequisite: Graduate standing or approval of the department. Fall.

452. Physics Teaching II. 4 Hours. Seminars on methodology and problems associated with teaching college physics in the laboratory. Individual student design and construction of an experiment in introductory physics. Supervised practice teaching in the physics laboratory. Prerequisite: Phys 451 or approval of the department. Winter.

453. Physics Teaching III. Current Practices, Problems, and Trends. 4 Hours. Seminars on current practices and trends in teaching physics at the college and precollege levels. Lectures on educational problems in an urban environment, educational testing methods, modern teaching instruments, and other special topics. Prerequisite: Graduate standing or approval of the department. Spring.

461. Statistical Mechanics. 4 Hours. Classical and quantum-statistical mechanics; Maxwell, Bose, and Fermi statistics; ensemble theory; imperfect gas; selected applications. Prerequisite: Phys 361 or approval of the department.

481. Mathematical Methods of Physics I. 4 Hours. Introduction to the linear methods of mathematical physics from the modern point of view. Mathematical foundations of quantum theory; classical problems of differential equations. Prerequisite: Approval of the department.

482. Mathematical Methods of Physics II. 4 Hours. Applications of linear analysis to ordinary and partial differential equations and integral equations. Properties of classical special functions and generalized functions. Prerequisite: Phys 481 or approval of the department.

491. Graduate Seminar. 1 to 2 Hours. May be repeated for a total of 6 hours. Satisfactory/unsatisfactory grade only. Seminars in areas of research activity within the department covering recent contributions to the literature and research in progress. Presentations by students, faculty, and scientists from other institutions. Prerequisites: Phys 411, 412. Fall, Winter, Spring.

497. Individual Study. 2 to 4 Hours. Satisfactory/unsatisfactory grade only. Special topics. Outside reading and a term paper are assigned by special arrangement with the department and faculty. Prerequisite: Approval of the department. Fall, Winter, Spring.

498. Special Topics in Modern Physics. 1 to 4 Hours. Lectures on topics of current interest. Subjects are announced. Prerequisites: Phys 411, 412. Fall, Winter, Spring.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Satisfactory/unsatisfactory grade only. Prerequisite: Approval of the department. Fall, Winter, Spring.

POLITICAL SCIENCE

Frank Tachau, Chairperson of the Department
John A. Gardiner, Director of Graduate Studies

Professors: Hollis W. Barber (Emeritus), Twiley W. Barker, Jr., John A. Gardiner, Doris A. Graber, Richard M. Johnson, Boyd R. Keenan, Byung-Chul Koh, Milton Rakove, Harry M. Scoble, Frank Tachau

Associate Professors: Isaac Balbus, George D. Beam, Don R. Bowen, Lyman A. Kellstedt, Allen Lerner, Barry Rundquist, Dick Simpson, Gerald S. Strom, John Wanat

Assistant Professors: George I. Balch, Elinor R. Bowen, Larry Cohen, Robert Crawford, John Echols, Peter R. Knauss, Mark Lichbach, Robert M. Rakoff, Laurie S. Wiseberg

The department offers work leading to the Master of Arts; in cooperation with the University of Illinois at Urbana-Champaign, to the Doctor of Philosophy; in cooperation with the Department of Economics, the College of Education, and the School of Urban Sciences, to the Doctor of Philosophy in Public Policy Analysis; and, in cooperation with the College of Business Administration and the School of Urban Sciences, to the Public Agency Administration specialization within the Master of Administrative Science. Students interested in the Public Policy Analysis program should read the degree requirements under Public Policy Analysis and consult the Public Policy Analysis listing. Students interested in the Public Agency Administration program should consult that listing in this bulletin for detailed information on admission and degree requirements.

These programs emphasize the structure and processes of urban policy-making including public administration as well as the political roles played by citizens and the analysis of public policy issues related to the contemporary urban scene. In the course of their training, students are expected to acquire both a theoretical perspective and the methodological tools necessary for the quantitative and nonquantitative analysis of political life.

The politics of public policy specialization in the PhD program in public policy analysis provides students with an understanding of (1) the nature of public policies and the role of public policies in addressing social problems; (2) the processes and contexts of public policy formulation and implementation; and (3) methods of analyzing policy problems and evaluating ongoing policies. Graduates of the program will be prepared for senior administrative or legislative staff positions; for positions as budget analysts, evaluators of public programs, political or program consultants, and other business and government positions requiring an understanding of the public sector; and for teaching and research careers.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and must submit satisfactory scores on the Graduate Record Examination (verbal and quantitative aptitude tests), and the advanced test in political science, three letters of recommendation, preferably from faculty members in political science or cognate disciplines who are familiar with the applicant's training and ability, and a statement of professional goals. In exceptional cases, students who have averages of less than 4.00 but above 3.75 may be admitted if

they can show evidence of substantial promise of ability to complete the program successfully.

Performance on the Graduate Record Examination, the undergraduate academic record, and the letters of recommendation are the three principal kinds of evidence considered in making decisions about admission and the awarding of assistantships. It is particularly advantageous, therefore, for the prospective applicant to take the Graduate Record Examination in the fall of the senior year.

The department accepts the minimum Graduate College requirement regarding the submission of transcripts (p. 31).

Students are encouraged to begin their work in the fall quarter, though applications for admission in other terms will be considered. Students who wish to be considered for teaching or research assistantships should apply as early as possible, preferably by March 1. Most appointments are announced by April 1.

Nondegree Admission

A limited number of nondegree students will be admitted each quarter. Applicants must submit a transcript from the institution that awarded their most recent degree and supply a letter stating why they feel nondegree admission would be beneficial to them. Nondegree students must satisfy all prerequisites for courses they plan to take.

Degree Requirements

Master of Arts

1. 48 quarter hours beyond the bachelor's degree for students electing the nonthesis option and 36 quarter hours (exclusive of thesis credit) for students electing to write a thesis. A maximum of two courses (8 quarter hours) may be taken outside the department.

2. All students must successfully complete (with grades of B or better) the following courses:

Political Science 400—Introduction to Public Policy Analysis

Political Science 402—Data Analysis for Politics and Policy II

Political Science 404—Research Design for Policy Research
Students who have previously taken equivalent course work may petition the director of graduate studies for a waiver of specific course requirements; no credit is given for a waived course.

3. At least 12 additional hours of course work at the 400-level.

4. For the thesis option, a thesis for which 12 quarter hours of thesis research credit is awarded, and an oral examination thereon.

5. For the nonthesis option, an examination covering the program of study; this requirement may be satisfied through the qualifying examination in the PhD program in public policy analysis, the candidacy examination in the political science PhD program, or an MA comprehensive examination.

Doctor of Philosophy in Public Policy Analysis

A minimum of 144 quarter hours of graduate work beyond the baccalaureate or 96 quarter hours beyond the master's is required. A plan of study for each student is prepared in consultation with and must be approved by the faculty adviser appointed by the director of graduate studies. While students can be admitted on a part-time basis, students who will be unable to enroll in at least two courses per term are likely to have difficulty in meeting program requirements; such students are encouraged to enroll in the MA in political science program or on a nondegree basis. All students take course work and examinations in four program areas,

participate in professional career training, and complete a dissertation.

Program Areas. Students specializing in the politics of public policy take course work and examinations in four areas: theory and methodology of public policy analysis, processes of policy-making and implementation, contexts of public policy, and public policy areas.

1. *Theory and Methodology of Public Policy Analysis.* This area focuses on the development of competence in the theories and methods that inform the study of public policy in its contextual, process, and substantive dimensions. Such analysis and evaluation should familiarize students with the diverse and conflicting concepts of "knowledge" and "science," their associated methodologies, and the normative-political implications of these conceptions and methodologies. It should also encourage them to master one or more of these conceptions and the research techniques associated with it. All students in the politics of public policy specialization are required to take the following courses:

Public Policy Analysis 400—Introduction to Public Policy Analysis

Economics 401—Microeconomics

Political Science 402—Data Analysis for Politics and Policy II (students without prior training in statistics must first take Political Science 301—Data Analysis for Politics and Policy I)

Political Science 404—Research Design for Policy Research

Political Science 410—Alternative Methodologies for the Study of Public Policy

Political Science 412—Data Analysis for Politics and Policy III

Students must take at least one additional course in economic analysis.

2. *The Processes of Policy-Making and Implementation.* The aim of courses in this area is to examine policy-making processes in a number of institutional contexts both within the United States and abroad. Nongovernmental political processes and the relationship between citizens and public policy agencies are also examined.

All students are required to take the following courses:

Political Science 403—Structure and Processes of American Public Policy

Public Policy Analysis 405—Public Policy: Formulation, Implementation, and Evaluation. In addition, one of the following courses is required:

Political Science 476—Public Budgeting

or

Urban Planning and Policies 411—Resource and Expenditure Planning

3. *The Contexts of Public Policy.* The aim of courses in this area is to place the processes of policy-making within broad historical, economic, institutional, cultural, and comparative contexts. Contexts to be examined include: capitalism, as it has developed in the nineteenth and twentieth centuries; the development of the modern nation state as a bureaucratic structure with an active role in the economy; and the cultural or ideological contexts provided by various societies throughout the world. Such contextual understanding provides a necessary framework for professional training. All students are required to take at least one course in this area.

4. *Public Policy Areas.* Courses in this area are designed to cover a broad range of governmental and other institutional policy activity and its impact. Students must take at least one course in one of the following substantive policy areas: energy and environmental policy; housing, land use, and planning policy; economic policy; education policy; health policy; law and criminal justice policy. These policy concerns are the main areas of competence within the program at this time; they will change as student and faculty interests change.

Qualifying Examination. Not later than four quarters after

admission or the completion of 48 quarter hours of work (whichever comes first), each student must take a qualifying examination covering the materials discussed in the following courses:

Public Policy Analysis 400—Introduction to Public Policy Analysis

Political Science 301—Data Analysis for Politics and Policy I

Political Science 403—Structure of American Policy-Making Institutions

Political Science 404—Research Design for Policy Research

Public Policy Analysis 405—Public Policy: Formulation, Implementation, and Evaluation

Economics 401—Microeconomics

A student who fails on the first attempt may petition to take the examination a second time. A third examination is not permitted. The qualifying examination is offered twice during the academic year.

Professional Career Training

All candidates are required to participate in one of the three programs described below. This professional career training may not begin until the student has completed at least 48 quarter hours of course work. Not more than 12 quarter hours of credit may be applied to the fulfillment of the degree requirements.

1. *Internship Option.* The student is assigned to an internship in a public or private agency on a full-time basis for at least one term. This field training leads to an analytical research paper on a policy problem selected before the student is placed, and agreed on by the student's adviser, the director of graduate studies, and the cooperating agency. This option is strongly recommended for students anticipating careers in government and other public or quasipublic institutions.

2. *Teaching Option.* The student enrolls in a course that explores different teaching philosophies and methodologies and will be assigned to participate in undergraduate instruction for at least one term. The assignment may involve independent responsibility for an introductory course, including the selection of texts, preparation of a course syllabus, student evaluation, and assignment of grades. Alternatively or additionally, a candidate may be assigned joint responsibility with a faculty member for an advanced undergraduate course. The student would be involved in all aspects of planning, teaching, and evaluation and would participate on a collegial basis with a faculty member. Each student will complete a paper on the theory and methodology of teaching, the design of a course, or the evaluation of a course.

3. *Research Option.* The student participates in a research project in collaboration with a faculty member or team of faculty members and students. Projects may focus on an actual problem in public policy analysis, may involve working directly with agencies and organizations related to the problem selected, and may contain a substantive field experience component. The student works as a full research colleague and is involved in all aspects of the project—design, execution, analysis, and reporting results. The student will make a formal presentation, oral or otherwise, on the project's findings.

Applications of Public Policy Analysis Techniques

Before taking the preliminary examination or engaging in dissertation research, all students must demonstrate an ability to apply the skills and knowledge acquired during the program: to do public policy analysis from design through data analysis, integrating the program's methodological and substantive materials. This requirement may be satisfied through an *extensive* seminar paper or directed research project, through the research option provided under the

professional career training requirement, or through an *extensive* research paper as part of the internship option under the professional career training requirement.

Distribution Requirement

In addition to core courses, all students must take at least three courses outside of political science. Courses used to satisfy other program requirements may be used to satisfy the distribution requirement, but will be used only once in calculating credit hours required for the degree.

Waivers of Program Requirements

Students may submit a petition to the director of graduate studies requesting waiver of a course or professional career training requirement. (E.g., a student with extensive prior training in political science may petition to waive Political Science 403.) Petitions must indicate the prior course work or experience that, it is felt, provides a background equivalent to the program requirement. In some cases, waivers will only be granted upon successful completion of a proficiency examination. Even in cases where course requirements have been waived, the subject matter of the required courses will be tested on the qualifying and preliminary examinations. No credit hours are awarded for waived requirements.

Preliminary Examination

After successful completion of the qualifying examination, a five-person committee will be appointed to advise each student on a program of study in preparation for the preliminary examination; the chairperson of this committee will serve as the student's adviser. At least two members of the committee must be of the graduate faculty and one must be from outside the area of specialization. The committee shall be appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies. The preliminary examination is scheduled when the committee concludes that the student has sufficient preparation, normally upon completion of course work and not later than three years after completion of the qualifying examination. The examination consists of two parts: a comprehensive written examination covering the student's program of study in the theory and methodology of public policy analysis, the processes of policy-making and implementation, the contexts of public policy, and public policy areas (some of these areas may be given greater emphasis than others in the examination), and an oral examination covering both of these areas and the student's dissertation prospectus.

Dissertation

A dissertation is required and must be defended before a committee appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies. The committee shall have at least five members, of whom at least two must members of the graduate faculty, one must be the candidate's dissertation adviser, and one must be from outside the area of specialization. The final version of the dissertation will incorporate any changes recommended by the committee. In most cases, a minimum of 36 quarter hours will be required to prepare a dissertation acceptable to the committee.

Doctor of Philosophy in Political Science

The doctoral program is a joint cooperative program with the Department of Political Science at the Urbana-Champaign campus of the University of Illinois. It is limited to the fields of political analysis, public policy, and urban politics. Students wishing to specialize in other fields—for example, international relations, area studies—should seek admission to the PhD program at the University of Illinois at Urbana-Champaign.

Details of this program are available on request from the director of graduate studies, Department of Political Science, UICC.

Courses for Graduate and Advanced Undergraduate Students

301. Data Analysis for Politics and Public Policy I. 4 Hours. Analysis of numeric data on politics and public policy, with emphasis on application and interpretation. Fundamentals of policy measurement, characteristics of univariate and bivariate distributions, logic, and procedures of statistical inference in public policy, use of standard computer program. Prerequisite: PolS 200 or 201 or graduate standing.

305. Local Political Decision-Making. 4 Hours. A research seminar. The problem of identifying and investigating political decisions in a major urban area like Chicago; an attempt is made to apply different theories of decision-making to local politics. Prerequisites: PolS 101 or 120 and consent of the instructor.

306. Ghetto Politics. 4 Hours. Analysis of the political impact of the ghetto on local, state, and national political systems; the impotence of the ghetto voter; the ghetto politician; ghetto riots as political protest; the ghetto and presidential politics. Prerequisite: Three courses in political science, American history, or sociology.

307. Urban Politics Seminar. 4 Hours. Analysis of the structure and dynamics of political parties and organizations in urban areas. Using Chicago and its suburbs as a laboratory, intensive study of the power structure, strength, and weakness of the Democratic and Republican parties in urban areas. Prerequisites: PolS 205 and consent of the instructor.

311. Studies in Urban Public Policies. 4 Hours. The problems of governing metropolitan areas; special emphasis on evolving patterns of cooperation among governments in metropolitan areas, such as metropolitan federalism, city-county consolidation, councils of governments, and regional planning commissions. Prerequisite: PolS 120 or 205.

314. Mathematical Models of Politics. 4 Hours. Introduction to formal and deductive models of politics. Topics include assumptions of rationality, political participation, game theory, Arrow's general impossibility theorem and majority rule, externalities, models of regulation and public policy, and electoral competition. Prerequisite: PolS 200.

315. Legislatures and Legislation. 4 Hours. The legislative function in government; structure and organization of American national, state, and local legislatures; party organization in legislatures; legislative procedure; pressure groups and lobbying; relation of legislature to other branches of government; problems of legislative reorganization. Prerequisite: PolS 101 or 120 or 151.

316. The President and Congress. 4 Hours. Analysis of the relationship of the President and Congress; problems involved in the formulation and execution of public policy. Prerequisite: PolS 101 or 120 or 151.

317. Intergovernmental Relations. 4 Hours. The origin and evolution of the American federal system; federal-state constitutional relationships; intergovernmental fiscal relations; the political cultures; interstate relations; regionalism; state-local relations; interlocal relations and cooperative federalism in functional areas. Prerequisites: PolS 101 or 151 and 205 or 212.

320. Studies in Urban Native Americans. 4 Hours. May be repeated for a maximum of 12 hours. Same as Native American Studies 320. Native American life in the city: involvement, problems, and responses; organizations; government structures and agencies. Specific topics are announced each term. Prerequisite: Junior standing or PolS 221.

327. Public Opinion and Political Communication. 4 Hours. The nature of public opinion and political communication systems; patterns of opinion distribution and techniques for opinion measurement; forces shaping public opinion, with emphasis on the mass media; the impact of public opinion on public policy; comparison of political communication patterns in the United States with less developed and totalitarian nations. Prerequisite: PolS 200.

328. Propaganda and Political Public Relations. 4 Hours. Same as Communication and Theater 328. The nature of propaganda, political symbols, and political public relations; the uses of political sym-

bols and propaganda in the political processes of democratic and totalitarian societies; international propaganda and psychological warfare; methods and uses of propaganda analysis. Prerequisite: PolS 200 or consent of the instructor.

332. Quantitative Study of Multinational Politics. 4 Hours. The usefulness of statistical reasoning in making inferences about international politics. Political decision-making, political conflict and cooperation, and political development and change in terms of three basic levels of analysis: multinational organization, nations, and international relations. Prerequisites: PolS 200, 230. Political Science 201 is recommended.

334. Political Socialization. 4 Hours. Introduction to the problems of how people learn about the polity, from whom they learn, under what circumstances, and with what consequences. Prerequisite: Three courses in political science, including at least one dealing with human political behavior.

337. The Politics of Alienation. 4 Hours. Conceptual, empirical, and normative analysis of alienation from polity, society, culture, and self. Focus on the political consequences of various forms of alienation, including radicalism, apathy, protest, revolution, renewal, and innovation. Empirical research is required. Prerequisites: PolS 200, 220. Political Science 201 is recommended.

340. The Politics of Urban Education. 4 Hours. Same as Education 306 and Urban Planning and Policy 306. Relations between school governance and urban politics. Particular attention to the role of educational interest groups, the school board, professional educators, citizens, and civic leaders in the formulation and execution of educational policy. Prerequisite: Consent of the instructor.

341. Political Culture. 4 Hours. Attitudes, values, beliefs, and behavioral norms that characterize the political system in the United States and other countries. Special problems, such as the nature of national identity, indicators of political cohesion, or determinants of political stability and instability, may be emphasized. Prerequisites: PolS 200, 230.

353. Topics in Public Law. 4 Hours. Supervised individual study of selected problems arising in the public law and judicial arenas. Prerequisites: PolS 190, 200, either 152, 252, 253, or 254, or consent of the instructor.

356. Administrative Law. 4 Hours. Legal problems arising in the relationships between the citizen and the government official; administrative rule making and enforcement; judicial review of administrative actions. Prerequisite: Consent of the instructor.

361. Political Leadership. 4 Hours. Contemporary political leadership and elites. Various approaches to, and theories about, political leadership in a variety of situational contexts, such as small groups, developing nations, revolutionary societies, complex political systems and organizations. Prerequisites: PolS 200, 230. Political Science 220 is recommended.

362. Seminar: Public Administration. 4 Hours. Supervised individual study of selected problems. Prerequisite: PolS 261 or 263.

364. Political Modernization. 4 Hours. The process of modernization in the United States and other countries; emphasis on the interaction between political and other factors, such as social change and economic growth; historical and contemporary patterns of political modernization and attendant problems. Prerequisite: PolS 200. Credit in PolS 230 is recommended.

381. Seminar: Political Problems of Developing Societies. 4 Hours. May be repeated to a maximum of 12 hours if the subject matter is different for each registration. Same as Latin American Studies 381. Selected aspects of the politics of the countries of Asia, Africa, and Latin America. Prerequisites: PolS 200, 232. Additional prerequisites may be stipulated depending on the subject matter of the seminar.

385. Women and Politics: Problems in Policy Analysis and Political Theory. 4 Hours. Same as Women's Studies 385. The political, social, and economic participation of women in American society. Theories on the use of power, socialization, and psychobiology as models in analyzing the outputs and outcomes of policies that affect women. Prerequisites: PolS 200 and one other 200- or 300-level political science course. Political Science 220 is recommended.

386. Problems in International Organization. 4 Hours. May be repeated once for credit. Subject matter varies from term to term but centers on one group of related problems pertaining to the United Nations or other international organizations. Prerequisites: PolS 200 and two courses in international politics or international organizations. Political Science 184 and 286 are recommended.

388. Seminar: Problems in American Foreign Relations. 4 Hours. Supervised individual study of selected problems of contemporary United States foreign relations. Prerequisites: PoLS 200 and either 184 or 281. Political Science 202 is recommended.

390. Seminar on Political Inquiry. 4 Hours. The assumptions and questions raised by different theories in the study of politics. Systems theories, functional analysis, rational, economic deductive, and/or other approaches may be examined. Prerequisites: PoLS 101, 190, 200.

391. Political Power. 4 Hours. The problem of the nature of political power. Introduction to some of the major literature of power and the development of the concept of political power as a descriptive category adequate to the comparative analysis of broader political phenomena, such as parties, official decision-making structures, and movements. Prerequisites: PoLS 101 or 120 and 4 hours of upper-division political science courses.

392. Democratic Theory. 4 Hours. Democracy as a procedure of government and the value commitments associated with this form of government. Special attention to corporate wealth, special interests, bureaucracy, and the mass media as they affect the existence of democratic government. Prerequisite: PoLS 290 or 291 or 292 or consent of the instructor.

395. Political Violence. 4 Hours. Seminar. Analysis of the use, or threat, of violence in the political process. Focus on domestic forms of violence and aggression in various nations viewed cross-culturally. Prerequisites: PoLS 101 or 151, two 4-hour courses in the social sciences, and consent of the instructor.

398. The Problem of Justice. 4 Hours. Same as Criminal Justice 398 and Religious Studies 398. The premodern view of justice, such as Plato's or Aristotle's; the modern understanding of justice, such as Hobbes's or Locke's, which is the foundation of the modern political regime; Rousseau's seminal political thought on justice, which is the basis for a variety of reforms and alternatives offered to Hobbes's and/or Locke's political regime. Prerequisite: Two courses in political science, including PoLS 101 or 151.

399. Seminar on Political Theory. 4 Hours. May be repeated for a total of 8 hours. In-depth analysis and discussion of selected problems or works in political theory. Prerequisites: PoLS 200, 291, 292.

Courses for Graduate Students

400. Introduction to Public Policy Analysis. 4 Hours. Same as Public Policy Analysis 400. Basic issues in the analysis and evaluation of public policy. The role and integration of values and ethics, concepts and concept development, logic, and relevant explanatory theories.

401. Experiencing and Interpreting Politics: The Use of Language. 4 Hours. Principles of concept formation in social science. Analysis of political words through ordinary language philosophy. Criteria of meaning, including the verification principle and logical positivism. The function of language in the study of politics. Prerequisite: PoLS 400.

402. Data Analysis for Public Policy. 4 Hours. Same as Public Policy Analysis 402. Data analysis: univariate descriptive statistics, display, cross-tabulation, transformation, causal inference, correlation and regression, statistical inference, interpretation. "Given a set of data, what trustworthy inferences can be drawn?" Emphasis on interpretation of data in ordinary language, for informed policy advice. Prerequisite: Graduate standing.

404. Research Design for Public Policy. 4 Hours. Same as Public Policy Analysis 404. An introduction to design consideration and methodological procedures for analyzing public policies. Focus on descriptive or exploratory quasi-experimental, experimental, survey, field, and historical designs, among others. Consideration of the strengths and weaknesses of various modes of data collection, including observation, survey research, and the use of artificial data, such as aggregate statistics. Relationships between design considerations and methodological procedures of reliability and validity. Prerequisite: PoLS 400.

405. Public Policy: Formulation, Implementation, Evaluation. 4 Hours. Same as Public Policy Analysis 405. A broad introductory overview of decision theories, governmental structures, and policy processes. Emphasis on the organizational and societal context of public policy formulation, implementation, and evaluation.

406. The Context of Public Policy: State and Economy. 4 Hours. Analysis of the transformation of functions and structure of the state

accompanying the transformation from competitive to monopoly capitalism. Competing explanations of the origins, and evaluations of the consequences of an interventionist welfare-state. Theoretical problems explored include the relative autonomy of the state from economic determinants, instrumentalist vs. structural theories of the state, and the relationship between state growth and centralization capitalism. Prerequisite: Consent of the instructor.

408. Government and Politics of Chicago. 4 Hours. The political process in Chicago, including an analysis of the city government and other governments, such as the park and sanitary districts. The role of the political parties, business and civic leaders, the press, and other factors involved in the governmental process. Prerequisite: PoLS 205.

409. Suburban Government and Politics. 4 Hours. Government and politics in suburban America. Particular attention to party structure, financing of governmental units, and the patterns of political competition in the suburbs. Prerequisite: PoLS 205.

410. Alternative Methods for the Study of Public Policy. 4 Hours. Critical, comparative analysis of the ontological and epistemological bases of alternative approaches to the study of public policy. Focus on logical positivism, phenomenology, and critical theory/dialectics. Prerequisite: PoLS 400 or consent of the instructor.

419. Urban Politics. 4 Hours. Introduction to professional literature of urban politics; consideration of political machines, community power structures, political participation in urban areas and municipal finance. Prerequisite: Consent of the instructor.

420. Special Problems in Urban Government. 4 Hours. Intensive study of selected current problems. Maximum emphasis on undertaking and reporting on independent research. Prerequisite: PoLS 205.

421. Urban Management Processes. 4 Hours. The political and administrative aspects of managing the urban environment. The specific tasks that face such urban executives as mayors, city managers, and department heads. Prerequisite: PoLS 212 or 317.

422. Seminar on Politics and Administration. 4 Hours. The interplay between politics and administration. The manner in which politics shapes and conditions public administration and vice versa. Both theoretical materials and empirical case studies are examined. Prerequisite: PoLS 261.

423. Special Topics in Public Administration. 4 Hours. Analysis of selected problems. Topics vary from year to year, depending upon the needs and interests of the students. Prerequisite: PoLS 261.

424. Problems in State Government. 4 Hours. Case analysis and research in selected problems dealing with the structure, functions, and administrative processes of American state governments. Prerequisite: PoLS 317 or 362.

425. Comparative Public Policy. 4 Hours. How countries establish and administer their policies, and how these policies differ from country to country. Taxation, income maintenance, equality, housing, health, education, workplace organization. United States compared with Western Europe and some of the communist nations.

426. Seminar on Legislation and Public Policy. 4 Hours. Intensive study of the institutional and dynamic forces that affect public policy-making in the United States. Emphasis on the separation of powers and the role of pressure groups, public opinion, and organizational bureaucracies as they affect the decision-making process. Prerequisite: PoLS 315 or 316.

427. Political Interest Group Theory. 4 Hours. Systematic critique of the concepts, methodologies, empirical findings, and generalized interpretations of American political interest group theory. Prerequisite: Consent of the instructor.

428. Topics in Political Communication. 4 Hours. May be repeated for credit up to a maximum of 12 hours. Intensive study of selected aspects, such as urban political communications patterns, communication elites, mass media influence on electoral politics, and mass media influence on political images. Emphasis on independent research, using a variety of communication research techniques. Prerequisite: Consent of the instructor.

429. Politics of Community Organizations. 4 Hours. Analysis of the objectives, strategies, and tactics of urban community organizations in the United States during the last two decades. Community organizations in New York City and Chicago, particularly in education and urban renewal. Prerequisite: Consent of the instructor.

445. Energy Policy and Administration. 4 Hours. Forces that have produced energy policies in the US, particularly since World War II, and the impact of the policies at the federal, state, and local levels of

government. Resource constraints imposed on US federal system by internal institutional factors and by external factors such as the oil embargo. Prerequisite: Consent of the instructor.

446. Seminar on Environmental Policies. 4 Hours. Research seminar on methods by which policy makers affect the physical environment in the United States. Discussion of physical, administrative, attitudinal, economic, social, and political constraints on policy. Proposals for changes in policy are evaluated. A major research project on some aspect of environmental control is expected. Prerequisite: PolS 266.

451. Law and Public Policy. 4 Hours. The role and functions of law and the judicial process in the formulation and implementation of public policy. Survey of major literature on inputs to the judicial process, participants in judicial decision-making, and the impact of court policies. Prerequisite: Consent of the instructor.

461. Policy Making Processes. 4 Hours. An advanced seminar on policy making in complex legislative and bureaucratic institutions. Topics include: the organization of decision-making routines, coalition formation, interinstitutional bargaining, and conditions affecting changes in policy-making processes. Prerequisite: PolS 405.

462. Public Policy Implementation. 4 Hours. Explores the means by which public agencies carry out policies selected as goals by policy-makers. Analyzes relationships among levels and branches of government in sharing responsibilities and resources for enforcing regulatory policies and controlling the flow of distributive benefits to communities. Analyzes the impact of causal variables in the implementation process on the goals of policies and explores alternative options.

471. Political Economy of Housing Policy. 4 Hours. Critical analysis of housing policies in capitalist societies, particularly the United States. Emphasis on the interrelations between private mortgage finance and construction industries and government activities. Analysis of the cultural-ideological aspects of housing. Prerequisite: Consent of the instructor.

476. Public Budgeting. 4 Hours. Examination of the budgetary process for public and quasi-public agencies. Historical development of budgeting in US; recent budgetary practices including program budgeting, PPBS, MBO, zero base budgeting, and budget analytic techniques; process of budget formulation; implementation of budgetary decisions; and theories of budgeting. Prerequisite: Consent of the instructor.

481. Evaluation of Policy Outcomes. 4 Hours. The procedures by which social science researchers investigate the impact of public policy on realization of objectives. The development of a measurement rationale for analyzing policy impact and the methodologies utilized in conducting the evaluation. Prerequisite: PolS 400.

482. Problems in American Constitutional Law. 4 Hours. Research in selected problems evolving from conflicting interpretations of the United States Constitution. Prerequisite: PolS 351 or 355 or the equivalent.

484. Topics in Public Policy Analysis. 4 Hours. A research seminar focusing on the student's development and execution of a research design for the analysis of a particular policy area. Prerequisite: PolS 481.

485. Seminar on Administrative Theory and Behavior I. 4 Hours. Analysis of the theory of bureaucratic organization in several substantive areas. The nature and function of theory in administrative study; basic concepts, hypotheses, and research findings in organizational theory and behavior; leadership theory, decision-making; organizational authority; patterns of accommodation between the organization and its members. Prerequisite: PolS 261.

486. Seminar: Comparative and International Administration. 4 Hours. Supervised individual study of selected problems. Prerequisite: PolS 263.

492. Graduate Field Experience in Political Science. 2 to 16 Hours. The student is placed in an organization on a part-time to full-time basis. Possible placement sites include, but are not limited to, government agencies, political party organizations, community groups, and various types of private organizations. Arrangements are made with the organization by the department and the student for both placement and an acceptable research project. The student's project culminates in a major paper evaluated by the supervising faculty member. Prerequisites: PolS 400, one additional graduate research methods course, one course in public administration or organization theory, one course in urban politics, and consent of the instructor.

497. Directed Readings in Political Science. 4 Hours. May be repeated for a maximum of 8 hours. Intensive readings on a topic not covered in the regular curriculum. Prerequisite: Consent of the instructor.

498. Independent Research in Political Science. 2 to 8 Hours. May be repeated for a maximum of 8 hours. Research on special problems not included in the regular course offerings. The work undertaken for this course may not duplicate that being done for Political Science 499. Prerequisite: Consent of the instructor.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Open only to degree candidates. Individual study and research required of all students pursuing the advanced degree in political science under the thesis option.

PSYCHOLOGY

I.E. Farber, Chairperson of the Department
Leon K. Miller, Director of Graduate Studies

Professors: Philip Ash, Gershon B. Berkson, Louis Berman, Rosalind D. Cartwright (Emeritus), John D. Davis, Roger L. Dominowski, Leonard D. Eron, I.E. Farber, Nancy Hirschberg, Harold Klehr, Benjamin Kleinmuntz, Eli Lipman, Susan M. Markle, Sheldon Rosenberg, Arnold Sameroff, Judith V. Torney, Harry S. Upshaw

Associate Professors: Alan A. Benton, Philip E. Freedman, Charles L. Gruder, Allen Howard, L. Rowell Huesmann, Rathe Karrer, Ernest W. Kent, Christopher Keys, Michael M. Levine, Vivian Lipman, Nan McGehee, Leon K. Miller, Rolf A. Peterson, Steven Reiss, Maris Rodgon, Alexander J. Rosen, Herbert H. Stenson

Assistant Professors: John Black, Nathan T. Clark, Shari Seidman Diamond, David Fay, Laurence Grimm, David McKirnan, Carol Peterson, Daniel Romer (Adjunct), Jeremy Shefner (Adjunct), R. Timothy Stein, Joseph Stokes, Leland Wilkinson

Clinical Associates: James Devine, Wayne Glad, Joseph Szysko, Sylvia Warshaw

Lecturers: Emil Peluso (Adjunct), Joseph Pantil (Adjunct)

The department offers work leading to the Master of Arts and the Doctor of Philosophy.

Admission Requirements

Regular Admission

The department accepts only applicants who wish to be candidates for the PhD. Applicants are not admitted as candidates for the MA as a terminal degree.

Applicants are expected to meet the following minimum department requirements:

A. A baccalaureate or its equivalent from an accredited college or university and a grade point average of at least 4.20 (A=5.00) for the last 90 quarter hours (60 semester hours) of undergraduate work.

B. The equivalent of 24 quarter hours in psychology, including statistics and a laboratory course in experimental psychology, one year of college mathematics, and one year of laboratory courses in physical and/or biological sciences.

C. Satisfactory scores on the Graduate Record Examination aptitude tests (verbal and quantitative) and the advanced test in psychology.

D. Satisfactory recommendations by three faculty members, preferably psychologists, who are familiar with the applicant's training and ability. In the case of candidates who have been engaged in professional work for some time, recommendations by supervisors may be submitted.

The foregoing requirements may be modified if the applicant's overall record indicates that these factors may underpredict ability to complete the program successfully. The department is committed to affirmative action and equal educational opportunity. Members of ethnic minority groups are strongly encouraged to apply.

Because graduate admissions are limited, it is usually not possible to accept all applicants who meet the minimum admission requirements listed above. Preference is given to candidates particularly well qualified in quantitative and experimental psychology and in the natural sciences. Even among highly qualified applicants, only those can be admitted whose substantive and professional interests can clearly be served by the department. Therefore, the department must be able to identify a suitable faculty member to sponsor every student admitted.

Students are admitted for the fall quarter only. Although applications may be accepted until the Graduate College deadline, applicants are strongly advised to complete them by February 15. Complete applications must include: (1) application for admission to the Graduate College; (2) all department forms included in the application package; (3) three letters of recommendation; (4) Graduate Record Examination scores; (5) official transcripts from institutions at which the applicant earned degrees and from all other colleges and universities attended in the last eight years. If the degrees were earned more than eight years prior to the quarter for which admission is sought, transcripts are required only from those institutions at which the applicant earned degrees (note that this last requirement differs from the minimum Graduate College requirement); and (6) application for graduate appointment (if any form of financial assistance is desired). Application materials specify the office to which each item should be sent.

Nondegree Admission

The Department of Psychology considers for nondegree admission applicants who (1) wish to improve their professional skills by taking particular courses and (2) have not been enrolled in a university for several years and are considering resuming their education.

Applicants must submit (1) an application for admission to the Graduate College and (2) official transcripts from institutions at which the applicant earned degrees and from all other colleges and universities attended in the last eight years. If the degrees were earned more than eight years prior to the quarter for which admission is sought, transcripts are required only from those institutions at which the applicant earned degrees. (Note that this last requirement differs from the minimum Graduate College requirement.)

Applicants must also submit, after consultation with a member of the nondegree admissions committee, a statement specifying: (1) each course the applicant proposes to take; (2) the quarter in which each course will be taken; (3) the purpose served by each course; and (4) written consent from the instructor of each proposed course. This statement will constitute an agreement between the department and students admitted as nondegree students concerning their course of study. Modifications of this agreement will require reapplication for admission.

Credit may not be earned in individual research or problems courses. Applicants should note that, according to Graduate College rules, if they are eventually admitted to the doctoral program, credit for no more than three courses taken as a nondegree student can be applied toward fulfillment of

degree requirements, and then only by petition. Applicants who wish to take only 100-, 200-, or 300-level courses should apply for admission as undergraduate nondegree students through the College of Liberal Arts and Sciences.

Degree Requirements

The department offers work leading to the Master of Arts and the Doctor of Philosophy. The faculty of the department is organized into an undergraduate division and nine graduate divisions, corresponding to substantive and curricular interests. Six of the divisions correspond to broad substantive areas: cognitive psychology, developmental psychology, learning-motivation, methodology and measurement, physiological psychology, and social psychology. Three divisions cover the graduate curriculum of the department: the academic curriculum, the clinical curriculum (APA approved), and the organizational curriculum. Course requirements have been established for each division. Students elect one substantive and one curricular division, which usually determine the program of study.

Master of Arts

A candidate must complete 48 quarter hours of graduate-level course work (including research) and present an acceptable thesis. At least 16 quarter hours must be in one of the six substantive divisions. This program will be established by the division. The candidate must also complete Psychology 343.

Doctor of Philosophy

A candidate must complete 144 quarter hours of graduate-level course work (including research). In addition, a candidate must have completed a master's thesis or its equivalent, pass a department preliminary examination, and present an acceptable dissertation. Courses offered in fulfillment of these requirements must include Psychology 343, 370, 443, 444, and the programs of one of the substantive divisions and one of the three curriculum divisions.

By virtue of its urban setting and its proximity to a large number of academic, health, and community institutions, the department has training and research facilities throughout the Chicago area. Among them are the University of Illinois Medical School, the Neuropsychiatric Institute, the Institute of Juvenile Research, the Chicago and suburban public schools, the Cook County Sheriff's Office Court Services training facilities, and the Chicago Association for the Retarded.

Courses for Graduate and Advanced Undergraduate Students

Note: The prerequisites stated apply to graduate majors in psychology. Nondegree students in psychology, students minoring in psychology, or students majoring in related fields may, with the consent of the instructor, enroll in certain courses without having met all prerequisites. All applicants for graduate nondegree status must, as a condition of admission, obtain written consent from the instructors of courses they intend to take.

312. Person Perception. 4 Hours. Analysis of theory and research on the perception and evaluation of persons in social settings, with emphasis on role theory, attribution, and social comparison processes. Applications to dynamics of interpersonal attraction, affiliation, and influence in experimental and natural settings. Prerequisite: Graduate standing or Psch 265 and consent of the instructor.

313. Social Judgment. 4 Hours. Analysis of the judgment process and its implications for social-psychological phenomena. Prerequisite: Graduate standing or Psch 265 and consent of the instructor.

314. Attitude Change. 4 Hours. Critical analysis of selected

contemporary theory and research. Topics include source and message effects, determinants of persistence of change and resistance to change. Prerequisite: Graduate standing or Psch 265 and consent of the instructor.

315. Cognitive Consistency Processes. 4 Hours. Critical analysis of research and theory related to the processes of information integration and its implications for attitude and opinion change. Emphasis on cognitive consistency formulations and their derivatives. Prerequisite: Graduate standing or Psch 265 and consent of the instructor.

316. Animal Behavior. 4 Hours. Principles and methods in the study of animal behavior; review of the social behavior of representative species in various phyla. Prerequisites: BioS 100, 101, 102, Psch 143. Berkson, Spring.

322. Advanced Developmental Psychology and Educational Processes. 4 Hours. Same as Education 322. Normal growth stages in language, physical growth, cognitive development, and social behavior from birth through adolescence; their relationship to major theories and to educational planning and practice. Prerequisites: Psch 101 and any one of Psch 220, Psch 224, Ed 210.

323. Psychology of the Exceptional Child. 4 Hours. Methods, results, and interpretation of studies of physically, intellectually, and emotionally deviant children, with special reference to their implications for education and behavior modification. Prerequisites: 12 hours of psychology, including Psch 258 or the equivalent, and consent of the instructor. Karrer, Spring.

324. Mental Deficiency. 4 Hours. Review of concepts, research, and methods of the scientific study of mental deficiency. Prerequisites: Psch 243 and 323, graduate standing, or consent of the instructor. Berkson, Winter.

329. The Theory of Jean Piaget. 4 Hours. Same as Education 329. Jean Piaget's genetic theory of the development of knowledge. His studies of cognitive development in children, especially his views on memory, learning, and intelligence. Educational implications. Prerequisites: Psch 101 and either Ed 210 or Psch 258 or graduate standing and consent of the instructor.

330. Organizational Psychology. 4 Hours. Same as Management 330. Individual psychological and group processes and their interaction with organizational structure. Behavioral factors in effective organizational change. Prerequisite: Graduate standing; or Psch 243, one course in social psychology or industrial psychology, and consent of the instructor. Benton, Stein, Fall.

332. Personnel Psychology. 4 Hours. Systematic study of the development and utilization of psychological techniques of personnel selection, classification, and assessment. Prerequisite: Graduate standing; or Psch 240, 243, and consent of the instructor. Ash, Spring.

333. Motivation and Moral in Organizations. 4 Hours. Same as Management 333. Concepts and methods in the assessment and modification of motivation, attitudes, and morale. Prerequisite: Graduate standing; or 12 hours of psychology, including Psch 330, and consent of the instructor. Ash, Winter.

338. Psychology of Industrial Conflict. 4 Hours. Same as Management 338. Behavioral analysis of the causes, dimensions, and modes of resolution of industrial conflict; special emphasis on labor-management relations. Prerequisite: Graduate standing; or Psch 330 or the equivalent. Benton, Fall.

343. Advanced Statistics I. 4 Hours. Elementary probability theory, empirical and theoretical distributions, points and interval estimation, hypotheses testing. Prerequisite: Graduate standing; or Psch 243 and consent of the instructor. Stenson, Winter.

345. Psychometric Applications. 4 Hours. Theory of psychological tests and measurement applied to problems of ability and personality testing; opinion sampling; reliability and validity; prediction and selection processes. Prerequisite: Graduate standing; or Psch 243 and consent of the instructor. Hirschberg, Fall.

350. Learning and Conditioning. 4 Hours. Methods, results, and interpretation of experimental studies of basic learning processes in animal and human subjects. Prerequisite: Graduate standing; or Psch 261 and consent of the instructor. Freedman, Fall.

351. Programmed Learning. 4 Hours. Theory and research in the techniques, applications, and results of programmed instruction. Prerequisite: Graduate standing; or Psch 224 and consent of the instructor. Markle, Winter.

352. Motivation. 4 Hours. Methods, results, and interpretation of experimental studies of basic motivational processes in animal and

human subjects. Prerequisite: Graduate standing; or Psch 261 or 266 and consent of the instructor. Davis, Winter.

353. Operant Conditioning. 4 Hours. Survey of basic principles and current research in the area of operant behavior. Prerequisite: Graduate standing; or consent of the instructor.

354. The Psychology of Language. 4 Hours. Same as Linguistics 374 and Communication and Theater 384. Introductory survey of methods, theory, and research; the history and present status of psychology's interest in language behavior. Prerequisite: Consent of the instructor. Rosenberg, Fall.

355. Higher Processes. 4 Hours. Methods, results, and interpretations of experimental studies of language behavior, problem-solving, concept formation, and creativity. Prerequisite: Graduate standing or consent of the instructor. Dominowski, Winter.

356. Sensory and Perceptual Processes I. 4 Hours. Methods, results, and interpretation of experimental studies dealing with the determination of psycho-physical functions. Primary emphasis on the perception of single discrete stimuli and attributes of stimuli. Prerequisite: Graduate standing; or Psch 250 and consent of the instructor. M. Levine, Fall.

357. Sensory and Perceptual Processes II. 4 Hours. Methods, results, and interpretation of experimental studies dealing primarily with the role of contextual and experimental factors in perception. Prerequisite: Graduate standing; or Psch 250 and consent of the instructor.

358. Computer Modeling in the Behavioral Sciences. 4 Hours. Same as Mathematics 306. Monte Carlo simulation; goodness of fit; process models versus stochastic models; protocol analysis; list processing; models of problem solving, learning, memory, language processing, pattern recognition, social interaction, and psychopathology. Prerequisites: Math 194 or 195, Math 280, and consent of the instructor.

359. Basic Brain Function. 4 Hours. Introduction; emphasis on the physiological basis of behavior. Physiology, anatomy, and pharmacology of the central nervous system. Physiological basis of behavioral constructs; brain function in abnormal behavior. Prerequisite: Graduate standing or Psch 256. E. Kent, Fall.

360. Human Factors. 4 Hours. Application of experimentally derived principles of behavior to the design of equipment for efficient use and operation. Sensory and perceptual processes, motor skills, and experimental methodology. Prerequisite: Graduate standing; or 12 hours of psychology, including Psch 250 and 251 or the equivalents. Stenson, Spring.

361. Instrumentation in Psychology. 4 Hours. Use of transducers, programming equipment, and recording systems in psychological research. Prerequisite: Graduate standing or consent of the instructor. Freedman, Winter.

362. Physiological Psychology. 4 Hours. Methods, results, and interpretation of experimental studies of physiological and neurochemical correlates of learning, motivation, and perception. Laboratory demonstrations and problems. Prerequisite: Graduate standing; or 12 hours of psychology, including Psch 359 or the equivalent, and consent of the instructor. E. Kent, Fall.

363. Behavioral Pharmacology. 4 Hours. Methods, results, and interpretation of experimental studies dealing with drugs and behavior. The role of drugs as tools in behavioral research and the use of experimental psychology techniques to explicate drug action. Prerequisite: Graduate standing; or Psch 359 and consent of the instructor. A. Rosen, Winter.

370. Systems and Theories. 4 Hours. Critical introductory analysis of major historical systems and their representation in current theoretical issues. Prerequisite: Graduate standing; or Psch 250, 251, and consent of the instructor. Farber, Spring, alternate years.

382. Introduction to Clinical Psychology. 4 Hours. The major areas, including assessment, treatment, and consultation, are considered in terms of current theory, practice, and research. Practicum work in a clinical endeavor, such as intellectual appraisal of children or organizational diagnosis of the elementary school, supplements classroom activity. Prerequisites: Psch 240 or 243 and consent of the instructor. Keys, Reiss, Fall, Winter.

387. Career and Educational Counseling in the Community College. 4 Hours. Same as Education 387. Introduction to sources of information on careers and educational programs; basic techniques of student personnel contact appropriate to community college students;

principles of career choice and guidance for students anticipating direct job entry or transfer to other institutions. Prerequisites: Psch 240 or Ed 250; Ed 321 or Psch 283 or 386 or the equivalents; and consent of the instructor.

391. Topics in Psychology. 2 to 4 Hours. May be repeated for a maximum of 12 hours of credit. Advanced treatment of an announced topic. Suggestions for topics should be submitted in writing to the department office. Prerequisite: Consent of the instructor or graduate standing.

397. Psychology and the Law. 4 Hours. Same as Criminal Justice 397. Application of psychological theories to legal problems; evaluation of the different approaches of law and psychology; methods for bringing about the evaluating social change through legal innovation. Prerequisites: CrJ 101, 102, Psch 255.

399. Problems in Psychology. 2 to 12 Hours. May be repeated for a total of 12 hours. Investigation of special problems under the direction of a staff member. Prerequisite: Consent of the instructor and the chairperson of the department.

Courses for Graduate Students

Note: The prerequisites stated apply to graduate majors in psychology. Nondegree students in psychology, students minoring in psychology, or students majoring in related fields may, with the consent of the instructor, enroll in certain courses without having met all prerequisites. All applicants for graduate nondegree status must, as a condition of admission, obtain written consent from the instructors of the courses they intend to take.

400. Memory. 4 Hours. Comparison of theoretical formulation and evaluation of research findings on human learning and retention. Bennett, Spring.

401. Experimental Psycholinguistics. 4 Hours. Same as Linguistics 471 and Speech and Theater 401. Intensive review of experimental laboratory studies concerned with the effects of phonological, syntactic, and semantic variables on sentence perception, comprehension, production, and memory in the mature user of language. The relevance of the research in contemporary psycholinguistic theory is emphasized. Prerequisites: Psch 354 or the equivalent and consent of the instructor. Fay, Rosenberg, Spring.

408. Instructional Psychology. 4 Hours. Psychological analysis of complex subject matter and the process of instruction; emphasis on the acquisition of structured knowledge. Dominowski, Spring.

409. Seminar on Cognitive Psychology. 4 Hours. May be repeated. Systematic review of special topics; emphasis on current research and theoretical developments. Prerequisite: Consent of the instructor.

411. Small Groups: Structure and Process. 4 Hours. Same as Sociology 411. Systematic survey of research and theory dealing with social interaction and social relationships in small groups; primary groups as agents of social influence and social control. Prerequisite: Consent of the instructor.

412. Research Methods in Social Psychology. 2 Hours. Principles of design, data collection, and analysis of social-psychological research in the laboratory and in naturalistic settings. Prerequisite: Psch 444. N. Clark, Fall.

413. Proseminar on Social Psychology. 2 Hours. May be taken for a maximum of 12 hours of credit. Survey of selected topics organized around a theme that may change each year. Student participation is central: reviews of literature, class presentations, proposed and conducted research, critiques. Enrollment is typically for three consecutive terms. Prerequisites: Graduate standing and consent of the instructor.

416. Theories of Social Behavior. 4 Hours. Current theoretical formulation and relevant data concerning major aspects of social behavior. Prerequisite: Consent of the instructor. Upshaw, Fall.

419. Seminar on Social Psychology. 2 Hours. May be repeated for credit. Critical discussion of selected topics, such as social judgment, group processes, attitude formation and change. Content varies. Prerequisites: Relevant 300- or 400-level courses in social psychology and consent of the instructor.

420. Advanced Developmental Psychology. 4 Hours. Theory and research on psychological development through adolescence; physical, mental, and social growth. Prerequisites: Psch 220 or the equivalent and consent of the instructor. Torney, Fall.



421. Developmental Psychobiology. 4 Hours. Review of theories of behavioral development from a biological orientation. Prerequisites: Psch 420 and consent of the instructor. Berkson, Winter.

422. Cognitive Development. 4 Hours. A review of contemporary theory and research in intellectual development from birth to young adulthood. Prerequisite: Psch 420. Rodgon, Spring.

423. Perceptual Development. 4 Hours. Contemporary theory and research in the assessment and development of perceptual capacities in children. Prerequisite: Psch 357, 420. Miller, Winter.

424. Social Development. 4 Hours. Discussion at an advanced level of processes and substantive areas of social development; major stress on social learning theory, socialization, dependency, identification, and cognitive-developmental processes as they influence social development. Participation in a small research or interview project is required. Prerequisite: Psch 420. Torney, Winter.

427. Developmental Psycholinguistics. 4 Hours. Same as Linguistics 472. Theoretical formulation, research methods, and research findings in the areas of language development. Biological foundations and environmental influences; disorders of language development. Prerequisites: Psch 354 or the equivalent and consent of the instructor. Fay, Spring.

429. Seminar on Developmental Psychology. 2 Hours. May be repeated. Systematic review of special topics; emphasis on current research. Prerequisites: Psch 420 or the equivalent and consent of the instructor.

430. Contemporary Theories of Psychotherapy. 4 Hours. Basic theories of psychological disorder as related to methods of treatment; comparative analysis of concepts and methods of cognitive, behavioral, and community intervention approaches. Prerequisite: Psch 472. R. Cartwright, Spring.

431. Organizational Psychology of Community Systems I. 4 Hours. Examination of various agencies in the Chicago metropolitan area, such as prisons and community mental health and senior citizen centers, through on-site observations, readings, and seminar participation. Organizational processes as they operate in community settings. Prerequisite: Consent of the instructor. Keys, Winter.

432. Organizational Psychology of Community Systems II. 4 Hours. Examination of various agencies in the Chicago metropolitan area, such as prisons and community mental health and senior citizen centers, through on-site observations, readings, and seminar participation. Apprenticeship experience with organizational processes as they operate in community settings. Prerequisites: Psch 431 and consent of the instructor. Stein, Staff.

433. Colloquium on Psychology Traineeship Research. 2 to 4 Hours. May be repeated. Satisfactory/unsatisfactory grade only. Presentation and discussion of trainee research and evaluation projects. Prerequisite: Acceptance in the an NIMH-sponsored training program. Gruder, Keys, Kleinmuntz, Fall, Winter, Spring.

434. Practicum in Organizational Psychology. 2 to 4 Hours. May be repeated. Satisfactory/unsatisfactory grade only. Supervised practicum in organizational settings, including industrial and educational institutions. Prerequisite: Psch 330.

435. Practicum in Psychotherapy. 4 Hours. May be repeated. Satisfactory/unsatisfactory grade only. Supervised practice in a coun-

selling or clinical setting. Application of basic principles; special emphasis on the problems of the culturally disadvantaged. Prerequisites: Psch 430 and consent of the instructor.

437. Simulations and Models of Social Systems. 4 Hours. Introduction to the philosophy and processes involved in model building. Examples of the application of existing models to a variety of organizational settings are discussed. Students design models and evaluate them. Prerequisite: Psch 444.

438. Seminar on Organizational Psychology. 4 Hours. May be repeated. Review of current topics, which are announced each term. Prerequisite: Consent of the instructor.

439. Research in Counseling and Psychotherapy. 4 Hours. Systematic review of special topics on individual treatment; emphasis on current research. Prerequisites: Psch 430 and consent of the instructor. R. Cartwright, Reiss, Spring.

442. Seminar on Research Methods. 2 Hours. Satisfactory/unsatisfactory grade only. Practice in evaluating research and discussion of methodology in relation to various research goals. Prerequisite: Graduate standing in psychology or consent of the instructor.

443. Advanced Statistics II. 4 Hours. Chi-square and F-distributions, analysis of variance, individual comparisons, regression, and correlation analysis. Prerequisite: Psch 343 or the equivalent. Korth, Spring.

444. Experimental Design and Analysis of Variance. 4 Hours. Analysis of variance and testing of hypotheses concerning contrasts in means in advanced experimental designs used in behavioral research. Prerequisite: Psch 443 or the equivalent. Wilkinson, Fall.

445. Multivariate Analysis. 4 Hours. The statistical analysis of functional relationships among two or more variables; various forms of correlation analysis; introduction to discriminant and factor analysis. Prerequisite: Psch 443 or the equivalent. Korth, Winter.

446. Experimenting in Field Settings. 4 Hours. Same as Criminal Justice 446. Problems associated with the collection and analysis of data in natural settings, emphasizing unobtrusive measures and the logic of causal inference based on correlational procedures and quasi-experimental designs. Prerequisite: consent of the instructor. Diamond, Spring.

447. Psychological Measurement. 4 Hours. Scaling theory and methodology; emphasis on measurement in psychophysics, differential psychology, and social psychology. Prerequisites: Psch 343 and 315 or 356 or the equivalents. Stenson, Fall.

448. Topics in Quantitative Psychology. 4 Hours. May be repeated for credit. Seminar on a preannounced topic in methodology, measurement, or mathematical psychology. Prerequisite: Consent of the instructor.

449. Seminar on Quantitative Methods in Psychology. 2 Hours. May be repeated. Systematic review of special topics; emphasis on current developments and applications. Prerequisite: Consent of the instructor.

450. Topics in Physiological Psychology. 2 to 4 Hours. May be repeated. Methods, results, and interpretations of experiments concerned with the neuroanatomical, neurophysiological, and neuropharmacological bases of learning, emotion, and perception. Prerequisites: Psch 362, 363. E. Kent, Spring.

451. Techniques of Psychological Intervention. 4 Hours. May be repeated with the consent of the instructor. Critical analysis of principles, techniques, and research in various types of psychological intervention. Each term the focus is on a different technique, such as behavior modification, psychotherapy, group therapy, play therapy, and community consultation. Prerequisite: Psch 430. R. Cartwright, Keys, Winter, Spring.

452. Physiological Bases of Emotion. 4 Hours. Methods, results, and interpretations of experiments with the neuroanatomical, neurophysiological, neuropharmacological, and neuroendocrinological substrates of emotional behavior. Prerequisites: Psch 362, 363.

453. Physiological Bases of Learning and Memory. 4 Hours. Methods, results, and interpretations of experiments with the neuroanatomical, neurophysiological, and neuropharmacological substrates of conditioned behavior. Prerequisites: Psch 350, 362, 363. E. Kent, Winter.

456. Discrimination Learning. 4 Hours. Generalization, simultaneous and successive discrimination, secondary reinforcement, and choice behavior are studied with respect to various theoretical

predictions. Oral presentations on related topics are required. Prerequisite: Psch 350. Freedman, Spring.

461. Advanced Instrumentation in Psychology. 4 Hours. Design of electronic instrumentation in psychological research. Alternate years concentrate on linear (amplification) or digital (logic) devices. Prerequisite: Psch 361. M. Levine, Spring.

472. Theories of Personality. 4 Hours. Contemporary theoretical formulations concerning personality and their evidential basis. Prerequisite: Psch 350 or 352. Farber, Fall.

473. Advanced Psychopathology. 4 Hours. A core course for all graduate students in clinical psychology. Detailed consideration of disorders of behavior, including description, etiology, prognosis, and experimental and clinical research; development and function of classification systems. Prerequisite: Psch 472. Eron, Winter.

474. Clinical Neuropsychology. 4 Hours. The current status of work in clinical neuropsychology; focus on the behavioral consequences of cerebral dysfunction and on the efforts to synthesize information on these consequences into a cohesive and systematic understanding of the basic brain-behavior relationship in man. Prerequisite: Psch 473.

479. Seminar: Theoretical, Historical, and Philosophical Issues in Psychology. 2 Hours. May be repeated. Same as History 479 and Philosophy 479. Systematic review of special topics; emphasis on current approaches and interpretations. Prerequisite: Consent of the instructor.

480. Behavior Disorders in Children. 4 Hours. Major types of maladjustment in childhood. Emphasis on the emotional, motivational, and intellectual difficulties of the culturally deprived. Prerequisite: Consent of the instructor. C. Peterson, Spring.

482. Psychological Appraisal I: Test Development, Intellectual Functions. 4 Hours. Theory of test development and test assessment. Theory, research, and techniques relating to the assessment of intellectual abilities. Training in the administration, scoring, and interpretation of standard test methods.

483. Psychological Appraisal II: Intellectual Functions and Structures Tests. 4 Hours. Intelligence tests in clinical use. Theory and research relating to the development and use of structured tests for personality assessment. Training in the administration, scoring, and interpretation of structured tests. Prerequisite: Psch 482 or the equivalent. Kleinmuntz, Spring.

484. Psychological Appraisal III: Projective Techniques. 4 Hours. Theory and research relating to the development and use of projective techniques for personality assessment. Training in the administration, scoring, and interpretation of projective techniques. Prerequisite: Psch 483 or the equivalent. R. Cartwright, Fall.

485. Practicum in Psychological Appraisal. 4 Hours. May be repeated. Satisfactory/unsatisfactory grade only. Supervised practice in psychodiagnostic testing in various facilities associated with the graduate training program in clinical and counseling psychology. Prerequisites: Concurrent registration in Psch 482 or 484 and consent of the instructor.

487. Practicum in Instruction in Psychology. 8 to 12 Hours. Satisfactory/unsatisfactory grade only. Supervised teaching of an undergraduate course and participation in a seminar dealing with techniques of course planning, teaching, and examining. Prerequisite: 6 hours of credit in Psch 490. Eron, Fall, Winter, Spring.

488. Seminar on Clinical Psychology. 2 Hours. Selected topics. Prerequisite: Consent of the instructor.

489. Seminar on Advanced Psychodiagnostics. 4 Hours. Consideration of a series of children and adolescents with varied behavior and school problems who have been studied intensively with psychodiagnostic procedures and for whom extensive follow-up data are available. Appropriate readings; clinical report writing. Prerequisites: Psch 484, 485, and consent of the instructor.

490. Colloquium on the Teaching of Psychology. 2 Hours. May be repeated for a total of 6 hours of credit. Satisfactory/unsatisfactory grade only. Problems and methods of teaching at the college level. Group discussion techniques; task analysis; test construction and analysis; curricular materials. Prerequisite: Graduate standing in the department. Dominowski, Freedman, Upshaw, Fall, Winter, Spring.

491. Research Apprenticeship. 2 to 4 Hours. May be repeated for a total of 8 hours of credit. Satisfactory/unsatisfactory grade only. Directed training in conducting research in specific areas of psychology and in developing skills related to this research. Prerequisite:

Consent of the instructor.

493. **Individual Research: Master's Thesis. 0 to 12 Hours.** May be repeated for a total of 16 hours of credit. Satisfactory/unsatisfactory grade only. Research on the topic of the master's thesis. Prerequisite: Consent of the instructor.

495. **Individual Research: Special Problems. 2 to 12 Hours.** May be repeated. Satisfactory/unsatisfactory grade only. Research on problems not included in thesis, dissertation, or preliminary research. Prerequisite: Consent of the instructor.

497. **Individual Research: Literature Review. 2 to 8 Hours.** May be repeated for a total of 8 hours of credit. Satisfactory/unsatisfactory grade only. Research on the topic of the preliminary paper. Prerequisites: Completion of the master's thesis and consent of the instructor. Gruder, Fall, Winter, Spring.

499. **Thesis Research. 0 to 16 Hours.** May be repeated. Research on the topic of the doctoral dissertation. Prerequisite: Consent of the instructor.

PUBLIC AGENCY ADMINISTRATION

John Wanat, Director of Graduate Studies, Department of Political Science

Coordinating Committee: Robert L. Crowson and Charles J. Orlebeke, School of Urban Sciences; Ronald L. Miller, Department of Management; Alvin D. Star, College of Business Administration; Allan Lerner and John Wanat, Department of Political Science.

The Public Agency Administration specialization leading to the Master of Administrative Science is designed to train administrators for public sector positions at federal, state, and municipal government levels. Students will have the opportunity to explore facets of public agency administration in depth in such fields as municipal and metropolitan management, personnel administration and union-management relations, policy formulation, energy and environmental administration, and other substantive policy areas based on faculty and student interests.

A second major field of specialization within the MAS program is listed in this bulletin under Business Administration.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and must submit three letters of recommendation from teachers familiar with their academic training or supervisors familiar with their professional experience. Applicants must also submit a 250-word statement of their educational and professional goals. Submission of verbal and quantitative scores on the Graduate Record Examination or Graduate Management Admission Test is required.

In exceptional cases, students who have averages of less than 4.00 may be admitted if they can show evidence of substantial potential to complete the program successfully. Such students may be admitted on limited status and will be required to remedy program deficiencies before being granted regular status.

The program accepts the minimum Graduate College requirement regarding the submission of transcripts (p. 31).

Nondegree Admission

A limited number of nondegree students will be admitted each quarter. Applicants must submit a transcript from the institution that awarded their most recent degree and supply a letter stating why they feel nondegree admission would be beneficial to them. Nondegree students must satisfy all prerequisites for courses they plan to take.

Degree Requirements

A minimum of 96 quarter hours of approved graduate work beyond the baccalaureate must be taken, of which at least 36 quarter hours must be at the 400 level.

A minimum of 48 quarter hours, including 36 at the 400 level, must be taken in residence within four calendar years. The degree requirements must be completed within six calendar years.

Credit toward the degree is not given for any course in which a grade of less than C has been received.

A thesis is not required.

Proficiency Credit. By proficiency examination or transfer of credit, a student may be granted up to 48 quarter hours of advanced credit. A petition is required.

Course Requirements

The program is divided into seven groups of related elements. Each group contains from two to five courses intended to convey essential knowledge and skills. Within course groups, certain options are available depending on career goals, prior training, and the approval of advisers. The required course groups and their constituent elements are listed below.

I. *The Political, Social, and Economic Contexts of Public Administration*—4 courses (16 quarter hours)

Political Science 430—Public Administration

Urban Planning and Policy 408—Planning Issues and Client-Servicer Relationships

Political Science 356—Administrative Law

or

Political Science 456—The Legal Environment of Administration

Economics 401—Microeconomics

or

Public Policy Analysis 410—Economic Approaches to Public Policy

II. *Analytic Tools for Administration*—3 courses (12 quarter hours). Students are required to complete one of the following sequences.

Quantitative Methods 470—Mathematical Methods I

Quantitative Methods 471—Mathematical Methods II

Quantitative Methods 472—Statistics: Theory and Applications

or

Urban Planning and Policy 373—Urban Planning Methods

Urban Planning and Policy 380—Quantitative Skills and Analytic Tools

Urban Planning and Policy 407—Advanced Methods of Urban Policy Analysis

III. *Individual, Group, and Organizational Dynamics*—2 courses (8 quarter hours). Students are required to complete one of the following sequences.

Political Science 485—Administrative Theory and Behavior I

Political Science 495—Administrative Theory and Behavior II

or

Management 440—Organization Theory
 Management 441—Organization Behavior

IV. *Policy Analysis*—3 courses (12 quarter hours).

Urban Planning and Policy 397—The Dynamics of Planned Change in Public Programs

or

Political Science 461—The Policy-Making Process

Political Science 463—Policy Implementation

Urban Planning and Policy 390—Policy and Program Evaluation

or

Political Science 481—Policy Evaluation

V. *Public Sector Administrative Processes*—5 courses (20 quarter hours).

Accounting 400—Managerial Accounting I

Urban Planning and Policy 411—Resource and Expenditure Planning

Management 373—Collective Bargaining in Public Employment

Political Science 476—Public Budgeting

Political Science 477—Public Personnel Systems

VI. *Specialization Course Work*—5 courses (20 quarter hours). Students will select, with consultation and approval of their advisers, courses from among the following areas or others:

Municipal and Metropolitan Management

Personnel Administration and Union-Management Relations

Transportation Administration

Natural Resources, Energy and Environmental Administration

Areas of concentration are subject to change in response to student and faculty interests.

VII. *Internship/Thesis/Project*—8 quarter hours. Each student is required to participate in one of the above activities designed in accordance with individual interests and career goals. Students should register for 8 quarter hours credit in the appropriate course.

Students should refer to the appropriate department listings for course descriptions.

PUBLIC POLICY ANALYSIS

Coordinating Committee: Robert L. Crowson, School of Urban Sciences; John A. Gardiner, Department of Political Science; Houston H. Stokes, Department of Economics; Donald R. Warren, College of Education.

The PhD in Public Policy Analysis is offered jointly by the Departments of Economics and Political Science, the School of Urban Sciences, and the College of Education. The program is multidisciplinary and is designed to train students for careers as policy analysts in public and private agencies concerned with urban-related policy issues or in teaching or research. Particular stress is placed on methodologies for the analysis of public policies and intensive training in a major area of specialization. Interested students should consult appropriate sections of this bulletin for specific admission and degree requirements of each specialization of the program.

The participating units also offer the MA and PhD in Political Science (the latter in cooperation with the University of Illinois at Urbana-Champaign), the MA in Urban and Quantitative Economics, the Master of Urban Planning and Policy, and the Master of Education. The faculties are listed under the respective departments in this bulletin.

Admission Requirements

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. A statement of professional goals and three letters of recommendation from faculty members or others familiar with the applicant's training, ability, and experience are also required. Applicants must also submit scores on the Graduate Record Examination (verbal and quantitative tests); some participating units require advanced tests. With the permission of the director of graduate studies, applicants may substitute verbal and quantitative aptitude test scores from the Law School Admission Test or other comparable tests. Applicants are encouraged, but not required, to submit scores from the advanced GRE test in such policy-related fields as economics, engineering, geography, history, political science, psychology, or sociology.

In exceptional cases, applicants with grade point averages of less than 4.00 but above 3.75 may be admitted if they can show substantial evidence of their ability to complete the program successfully. Such students will be admitted on limited status.

Nondegree Admission

A limited number of nondegree students will be admitted each term. Applicants must submit a transcript from the institution that awarded their most recent degree and supply a letter stating why they feel nondegree admission would be beneficial to them. Nondegree students must satisfy all prerequisites for courses they plan to take.

Degree Requirements

A minimum of 144 quarter hours of graduate work beyond the baccalaureate is required. The plan of study for each student is prepared in consultation with and must be approved by the adviser assigned by the director of graduate studies. It must have four components (core curriculum, area of specialization, professional career training, and dissertation).

Core Curriculum

Lecture-discussion courses, independent study, colloquia, and seminars provide the theoretical underpinnings and analytical tools for advanced public policy analysis. Unless they have previously taken equivalent courses, all candidates must complete work in five core areas of study: methodologies for policy research, research design, quantitative analysis, economic policy, and public policy formulation, implementation, and evaluation. Courses that satisfy core requirements are listed under Economics, Education, Political Science, and Urban Planning and Policy.

Qualifying Examination. Not later than four terms after admission to the program or the completion of 48 quarter hours of work, each student must take a written qualifying examination testing mastery of and ability to integrate the core curriculum concepts. The examination will be administered by the faculty coordinating committee for each specialization. With the approval of the coordinating committee, a student who fails on the first attempt may take the examination a second time. A third examination is not permitted. The examination is offered during the fall and spring quarters.

Area of Specialization

The student must select an area of specialization in economic policy, education policy, urban planning and policy, or the politics of policy-making. The requirements for each specialization are specified under the respective academic units in this bulletin.

Distribution Requirement

Beyond the public policy analysis core, students must take at least 12 quarter hours of approved course work in specializations other than the one in which they are enrolled.

Professional Career Training

Professional career training is required of all students. It may not begin until the student has completed at least one year of course work. Not more than 12 quarter hours of credit may be applied to the fulfillment of degree requirements. The training may take the form of an internship in a public or private agency, teaching responsibilities within the University, or collaboration with faculty on a research project.

Preliminary Examination

The preliminary examination is normally taken upon

completion of the course work and consists of two parts: a comprehensive written examination covering the student's program of study in the area of specialization and an oral examination covering both the student's program in the area of specialization and the student's dissertation prospectus.

The student will be examined by a five-person committee of whom at least two must be members of the graduate faculty and one must be from outside the area of specialization. The committee shall be appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies of the unit of the student's specialization.

Dissertation

A dissertation is required and must be defended before a committee appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies of the unit of the student's specialization. The committee shall have at least five members, of whom at least two must be members of the graduate faculty, one must be the candidate's dissertation adviser, and one must be from outside the area of specialization. The final version of the dissertation will incorporate any changes recommended by the committee.

Courses for Graduate Students

400. Introduction to Public Policy Analysis. 4 Hours. Same as Political Science 400. Basic issues in the analysis and evaluation of public policy. The role and integration of values and ethics, concepts and concept development, logic, and relevant explanatory theories.

402. Data Analysis for Public Policy. 4 Hours. Same as Political Science 402. Data analysis: univariate descriptive statistics, display, cross-tabulation, transformation, causal inference, correlation and regression, statistical inference, interpretation. "Given a set of data, what trustworthy inferences can be drawn?" Emphasis on interpretation of data in ordinary language, for informed policy advice. Prerequisite: Graduate standing.

404. Research Design for Public Policy. 4 Hours. Same as Political Science 404. An introduction to design consideration and methodological procedures for analyzing public policies. Focus on descriptive or exploratory quasi-experimental, experimental, survey, field, and historical design, among others. Consideration of the strengths and weaknesses of various modes of data collection, including observation, survey research, and the use of artificial data, such as aggregate statistics. Relationships between design considerations and methodological procedures of reliability and validity. Prerequisite: PoIS 400.

405. Public Policy Formulation, Implementation, Evaluation. 4 Hours. Same as Political Science 405. A broad introductory overview of decision theories, governmental structures, and policy processes. Emphasis on the organizational and societal context of public policy formulation, implementation, and evaluation.



QUANTITATIVE METHODS

Leonard Kent, Head of the Department
Edward T. Minieka, Director of Graduate Studies

Professors: Leonard Kent

Associate Professors: Edward T. Minieka, Lalitha P. Sanathanan, Walter J. Wadycki

Assistant Professors: Percy Brill, Paul Chouinard, James Hall, Stella Machado, Harry Perros, Peter Simmons

The Department of Quantitative Methods offers, in cooperation with the Department of Economics, sequences of courses in the program leading to the Master of Arts in Urban and Quantitative Economics.

Recently there has been a rapid growth of a body of knowledge in which mathematics and statistics are applied to the analysis of problems in business and economics. While these developments have been based on techniques drawn from matrix algebra, calculus, probability theory, and statistics, they have stimulated new types of mathematical analyses—linear programming, dynamic programming, theory of games, and other analytical techniques usually associated with operations research. Another offshoot of these developments has been a growing reliance on computers and systems analysis to solve real-world problems that are often too complex to be handled with strictly analytical techniques. The discipline of economics thus offers a new challenge to the mathematically sophisticated student. This program, offered by the Department of Quantitative Methods, enables such students to bring an analytical approach to problem-solving in both the public and the private sectors of the economy.

In addition to qualifying the student for a research or administrative career in government, business, or nonprofit institutions, the program enables graduates to find employment in such specialized fields as systems analysis, operations research, computer center operation, statistical quality control, and statistical sampling. The quantitative methods sequence also provides continuing education for statisticians, economists, and systems analysts in the Chicago area interested in professional advancement in their specialties.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and are encouraged to submit scores from either the Graduate Record Examination advanced test in economics or the Admissions Test for Graduate Studies in Business. While no minimum score is required, the faculty looks favorably on scores at or above the 70th percentile. In exceptional cases, students who have grade point averages of less than 4.00 but above 3.75 may be admitted if they can show evidence of substantial promise of ability to complete the program successfully.

Students with quantitatively oriented training—especially those with majors in business, economics, engineering, geography, mathematics, psychology, and statistics—are encouraged to apply. The following courses are required of all applicants, regardless of their undergraduate major:

Courses in mathematics containing material equivalent to the topics in Mathematics 104, 110, 111, and 112 at this University (mathematics through introductory calculus).

Courses in statistics equivalent to Quantitative Methods 170, 171, and 172 (statistics through regression analysis) in the College of Business Administration at this University.

One course in intermediate microeconomic theory and one course in macroeconomic theory.

If the preparation in these courses is not in evidence, the student must make up any deficiency within the first three terms.

Degree Requirements

The student electing to take the quantitative methods sequence in the MA in Urban and Quantitative Economics must complete 48 quarter hours of satisfactory work consisting of 32 hours of core requirements listed below and 16 hours of electives to be taken within the Department of Quantitative Methods at the 300 or 400 level. The student must also participate in an internship program or independent study (Economics 497 or 498). The student who chooses the internship program receives credit for 4 hours of electives. The student who chooses Economics 498 receives credit for 4 hours of the core requirements.

Core Requirements: (32 hours)

Economics 401—Microeconomics I, 4 hours

Economics 411—Macroeconomics I, 4 hours

Economics 402—Microeconomics II, 4 hours, or Economics 412—Macroeconomics II, 4 hours

A 400-level course in applied economics, 4 hours. One of the following is recommended:

Economics 435—Advanced Econometrics

Economics 436—Advanced Mathematical Economics

Economics 471—Advanced Urban Economics I

Economics 472—Advanced Urban Economics II

Economics 497—Independent Study in Economics

Economics 498—Workshop in Economics

One additional elective course in economics at the 300 or 400 level, 4 hours

Quantitative Methods 472—Statistics: Theory and Applications, 4 hours

Quantitative Methods 360—Operations Research I, 4 hours, or Quantitative Methods 376—Survey of Operations Research, 4 hours

Quantitative Methods 375—Information Systems, 4 hours

Upon admission, each student develops an MA study plan, in collaboration with the graduate adviser, that will constitute the course of study during enrollment.

The student must pass a comprehensive written examination based on three courses in economic theory. This examination includes one part on Microeconomics I, one part on Macroeconomics I, and one part on either Microeconomics II or Macroeconomics II. This comprehensive examination is distinct from the examinations given for the courses.

See also the Department of Economics listing.

Courses for Graduate and Advanced Undergraduate Students

345. **Advanced Economic Statistics. 4 Hours.** Same as Economics 345. Probability, hypothesis testing, and estimation, with emphasis on economic applications; econometric models, multiple linear regression, and introduction to problems of estimation. Prerequisites: Math 370 and 372 or QM 172. Business administration students must have declared a major, Fall.

353. **Business Systems Simulation I. 4 Hours.** Various approaches to problems involving the operations of a system from the perspective of the entire company; optimal decisions are generated for the controllers of the system. Prerequisites: Math 194 or 195, QM 172 or the equivalents. Business administration students must have declared a major. Perros, Winter.

354. **Business Systems Simulation II. 4 Hours.** Computer-assisted experimentation by simulation of a mathematical model of the student's design to gain insight into the performance of the system and

establish causal relationships between input and output. Prerequisite: QM 353 or consent of the instructor. Perros, Fall, Spring.

355. Computer Performance Evaluation and Modelling. 4 Hours. Probabilistic, simulation, and statistical techniques for modelling computer systems with a view to evaluating their performance. Models of multiprogramming systems, multi-access systems, input/output systems, priority queues, and paging systems are described. Prerequisites: QM 172, Mgmt 255, and a business core computer language course or the equivalents or consent of the instructor. Business administration students must have declared a major.

360. Operations Research I. 4 Hours. May be substituted for Systems Engineering 371. Credit is not given for both Quantitative Methods 360 and Systems Engineering 371. Linear programming; simplex algorithm, duality, sensitivity testing, convex programming, parametric programming. Transportation problem: solution techniques, relationship to linear programming, assignment. Applications. Prerequisites: Math 112, QM 171 or the equivalents. Business administration students must have declared a major. Minieka, Fall.

361. Operations Research II. 4 Hours. Nonlinear operations research. Nonlinear programming: optimality conditions, convexity, heuristic methods, applications. Inventory control theory: classical models, stochastic complications. Integer programming: enumerative techniques, cutting plane techniques. Prerequisite: QM 360 or 376 or the equivalent. Business administration students must have declared a major. Minieka, Winter.

362. Operations Research III. 4 Hours. May be substituted for Systems Engineering 350. Credit is not given for both Quantitative Methods 362 and Systems Engineering 350. Stochastic optimization problems. Markov chains, queuing theory, stochastic inventory control theory, dynamic programming. Prerequisites: Math 112, QM 172 or the equivalents. Business administration students must have declared a major. Perros, Spring.

363. Statistical Decision Analysis. 4 Hours. Prior and posterior distributions. Conjugate priors. Value of information. Applications to decision-making in business. Prerequisite: QM 171.

369. Multivariate Analysis I. 4 Hours. Introduction to the structure and analysis of multivariate data, using the multivariate normal model. The relevant matrix theory; multilinear regression; tests concerning multivariate means; multivariate analysis of variance. Prerequisite: QM 172. Business administration students must have declared a major. L. Kent, Fall.

370. Multivariate Analysis II. 4 Hours. Multivariate techniques of data analysis in common use. Topics include principal components, factor analysis, canonical correlation, discriminant analysis classification procedures. Prerequisite: QM 369. Business administration students must have declared a major. L. Kent, Winter.

371. Survey Sampling: Theory and Methods I. 4 Hours. Development of survey sampling theory and methods peculiar to planning, conducting, and evaluating surveys. Simple random, stratified, ration, and cluster sampling. Sample size election and the optimum determination of the sampling unit. Prerequisite: QM 172. J. Hall, Winter.

372. Survey Sampling: Theory and Methods II. 4 Hours. Further development of advanced survey sampling techniques; emphasis on application. Prerequisite: QM 371. Staff, Spring.

373. Analysis of Variance and Experimental Design. 4 Hours. General theory of design and analysis of experiments. Least-squares estimation, multiple regression, analysis of variance, randomization, randomized blocks, Latin squares, factorial designs, replication, incomplete blocks. Prerequisite: QM 172. Business administration students must have declared a major. Staff, Spring.

375. Business Information Systems. 4 Hours. Design and development of computer-based information systems from a management perspective; identification and measurement, feasibility, systems implementation, and evaluation. Prerequisite: QM 172 or the equivalent. Business administration students must have declared a major. Simmons, Fall.

376. Survey of Operations Research. 4 Hours. Methods, techniques, and applications; linear programming, simulation, production and inventory theory, queuing theory, game theory. Prerequisites: QM 172, Math 112. Business administration students must have declared a major. Staff, Spring.

377. Business Computer Technology. 4 Hours. Nonprogramming treatment of fundamental concepts of computer technology; prevalent forms of computing systems in business, including time-sharing and

multiprogramming; detailed discussion of the control of the system and integration of the system with the firm's operations. Prerequisites: Math 194 or 195, QM 172 or the equivalents. Business administration students must have declared a major. Staff, Winter.

378. Dynamic Programming. 4 Hours. Theory and application to solving problems in multistage decision processes arising in a wide variety of fields, such as operations research, engineering, and mathematics. Deterministic and random processes are considered, and computational and analytical methods of solution derived. Prerequisites: Math 133, 220 or the equivalents. Business administration students must have declared a major. Staff, Spring.

379. Business Information Systems II. 4 Hours. In-depth treatment of selected issues in the design, development, and evaluation of computer based business information systems: forms design, multi-function information systems design, general software systems, user interfaces, research systems, quality control, and documentation standards. Prerequisite: QM 375 or the equivalent or consent of the instructor. QM 377 is recommended. Business administration students must have declared a major.

380. Problems in Graph Theory. 4 Hours. May be substituted for Systems Engineering 460. Credit is not given for both Quantitative Methods 380 and Systems Engineering 460. Same as Mathematics 380. Optimization problems: theory and solution. Shortest path problems. Transportation problems: coverings, spanning trees, perfect graphs. Urban scheduling problems: traveling salesman problem, postman problem. Prerequisite: QM 376. Minieka, Spring.

381. Integer Programming. 4 Hours. Formulation of mathematical programming problems as integer programming problems; solution techniques, including implicit enumeration and cutting plane methods; nonlinear integer programming; integer programming over graphs. Prerequisite: QM 360 or 376. Business administration students must have declared a major.

399. Independent Study in Quantitative Methods. I to 4 Hours. May be repeated for a total of 12 hours. Intensive study of selected topics determined in consultation with the instructor and department head. Prerequisites: Major in quantitative methods and consent of the department head.

Courses for Graduate Students

450. Advanced Statistics. 4 Hours. Same as Economics 450. In-depth presentation of statistical methodology including underlying theory and practical applications. Distribution theory, estimation and testing of hypotheses, nonparametric methods, contingency tables, analysis of variance, regression and correlation analysis, applications of statistical methodology to economic forecasting, bio-assay, control charts, life testing. Prerequisite: QM 172 or the equivalent.

461. Optimization Methods. 4 Hours. Techniques for optimizing functions of several variables. Techniques for unconstrained optimization include univariate search, direct search, and gradient methods. Techniques for constrained optimization include transformations, penalty functions, and nonlinear programming methods. Prerequisites: QM 361 or 470 or the equivalent or consent of the instructor.

470. Mathematical Methods I. 4 Hours. Designed primarily to introduce and/or review areas of mathematics necessary for the development and understanding of the analytic tools students will encounter in subsequent courses of a master in business administration program. Elementary set theory; mathematical functions; introduction to probability concepts; differential and integral calculus; series; functions of several variables. Prerequisite: One term of college algebra or the equivalent and approval of the director of graduate studies in business administration.

471. Mathematical Methods II. 4 Hours. Sets and set functions; vector and matrix algebra; introduction to linear programming and game theory. At least one hour per week of laboratory in the use and application of digital computers and developments in computer technology applicable to modern business operations. Prerequisites: QM 470 and approval of the director of graduate studies in business administration.

472. Statistics: Theory and Applications. 4 Hours. Statistics and scientific method; uncertainty and probability, including Bayesian theory; binomial normal, t , Chi-square, and F distributions; testing hypotheses and estimation; decision theory; analysis of variance, including regression and correlation; time series. Prerequisites: QM 471

and approval of the director of graduate studies in business administration.

473. **Statistical Methods for Qualitative Data. 4 Hours.** Statistical analysis of multivariate discrete (categorical) data using log linear models, including Chi-square test based on these. Logistic models relating a qualitative response variable to several independent variables (discrete or continuous). Applications using relevant computer programs. Prerequisite: QM 345 or the equivalent.

474. **Statistical Decision Theory. 4 Hours.** Hypothesis testing from the classical and Bayesian viewpoints with applications of probability to the making of decisions; some treatment of game strategy and its parallels in decision-making. Prerequisite: QM 472.

475. **Business Research and Forecasting. 4 Hours.** Same as Economics 437. The role of research in business; forecasting methods and techniques, including models and their applications. Prerequisite: QM 472 or Econ 434.

497. **Independent Study in Quantitative Methods. 4 Hours.** Independent study under the direction of a faculty member. Prerequisite: Consent of the instructor.

SLAVIC LANGUAGES AND LITERATURES

Nicholas Moravcevic, Head of the Department
Lauren Leighton, Director of Graduate Studies

Professors; Timoteusz Karpowicz, Lauren Leighton, Nicholas Moravcevic

Associate Professors: Andrzej Cienski (Visiting), Paula Lewin (Visiting), Olga Nedeljkovic, Wilma Hoffmann, Jaroslav Schejbal, Biljana Sljivic-Simsic

Assistant Professors: Bohdan Rubchak, Sona Hoisington, Malgorzata Pruska-Carroll, Wanda L. Sorgente

The department offers work leading to the Master of Arts with specializations in Russian cultural heritage, Polish cultural heritage, and Slavic linguistics, including individual options in Ukrainian, Serbian, and Czech studies.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university (or the equivalent from a foreign university) and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and must submit three letters of recommendation. In exceptional cases, students who have averages of less than 4.00 but above 3.75 may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. Applicants whose undergraduate major was not in Slavic studies and those from other institutions must take a proficiency test in the Slavic language of their intended concentration and must remedy any deficiencies in their preparation before being granted full standing in the graduate program.

The Graduate Record Examination is not required.

Degree Requirements

Credit Distribution. A minimum of 56 quarter hours of credit is required, distributed as follows:

A. *Ethnic studies.* A basic core sequence of two courses totaling 8 quarter hours offered by the Department(s) of Sociology, History, or Political Science and approved by the

Department of Slavic Languages and Literatures is required for all candidates.

B. *Elective areas of specialization* (Russian cultural heritage; Polish cultural heritage; Slavic linguistics; Ukrainian, Serbian, and Czech studies). A sequence of courses totaling at least 32 quarter hours, with a minimum of 16 hours at the 400 level. Candidates in the areas of cultural heritage must present at least 8 of the required 32 hours in the linguistics program; those in the linguistics area, at least 8 quarter hours in a cultural heritage program of their choice.

C. *Electives.* 16 quarter hours at the 300 or 400 level chosen from A or B above.

Comprehensive Examination. The examination consists of two parts. Part One tests the student's preparedness in ethnic studies. Part Two, based on both course work and the department's reading list, tests the student's preparedness in the area of specialization. Those who fail the examination may retake any portion(s) no later than one calendar year after the first attempt.

A thesis is not required.

Master of Arts Program for Teachers

Candidates who desire to prepare for high school teaching but have not earned state certification during their undergraduate study can, in consultation with their advisers, elect a program in either cultural heritage or linguistics that would also include the course work required for certification. Such work, however, is in addition to the department MA requirements.

Part-Time Study

Part-time enrollment (through the availability of late afternoon and summer programs) can be selected by those candidates whose employment or other obligations exclude their full-time participation in the program.

SLAVIC

Courses for Graduate and Advanced Undergraduate Students

300. **Introduction to Bibliography and Research. 4 Hours.** May be required of Master of Arts candidates in Slavic studies at the discretion of the department. Bibliographical and research tools applicable to Slavic studies. Prerequisite: Graduate standing or consent of the instructor.

310. **Introduction to Slavic Linguistics. 4 Hours.** Survey of fundamental linguistic concepts; theoretical methods most applicable to analysis of the Slavic languages. Prerequisites: Graduate standing and two years of Russian or some other Slavic language. Advanced undergraduate students with exceptional ability may be admitted with the consent of the instructor.

340. **Foreign Language Computer-Assisted Instruction. 4 Hours.** Same as French 385, German 340, and Spanish 375. Does not count toward the major. Basic introduction to the use of the TUTOR language and the PLATO IV system in foreign language instruction. Each student designs and implements an instructional module as a term project. Prerequisite: Completion of the intermediate level, or the equivalent, of either French, German, Spanish, or a Slavic language.

390. **English-Slavic Linguistic Interaction. 4 Hours.** The structural, phonetic, and idiomatic influence of English on the various Slavic languages spoken in the American Slavic ethnic communities. Slavic influence on English spoken in these communities. Prerequisite: Slav 310.

392. **The Structure of Modern Serbo-Croatian. 4 Hours.** Synchronic linguistic analysis of major and minor parts of speech. Word formation, with emphasis on substantives, adjectives, and verbs. Fundamentals of syntax. Prerequisite: Slav 310.

393. **The Structure of Modern Czech. 4 Hours.** A synchronic/paradigmatic and syntagmatic analysis of the Czech language. Prerequisite: Slav 310.

399. Independent Study. 1 to 4 Hours. Investigation of special problems under the general direction of a staff member. Prerequisite: Consent of the instructor and the head of the department.

Courses for Graduate Students

410. Old Church Slavonic. 4 Hours. Phonology, morphology, and basic elements of syntax. Readings in selected texts. Prerequisite: At least three years of college Russian.

411. Readings in Old Slavic Texts. 4 Hours. May be repeated for credit. Specific languages are announced each term. Prerequisites: Slav 410 and consent of the instructor.

412. History of the Serbo-Croatian Language. 4 Hours. Formation and development of standard Serbo-Croatian to the mid-nineteenth century. Analysis of selected texts. Prerequisite: Slav 410.

413. Serbo-Croatian Linguistics and Poetics. 4 Hours. Linguistic and stylistic analyses of Serbo-Croatian texts based on contemporary theories. Prerequisite: Graduate standing.

414. Seminar on Serbo-Croatian Linguistics. 4 Hours. May be repeated for a total of 8 hours of credit. Specific topics are announced each term. Prerequisite: Graduate standing.

420. Comparative Slavic Linguistics. 4 Hours. A diachronic study of the relationship between the Slavic languages; their place within the Indo-European language family. Prerequisites: Slav 310, 410.

430. Seminar on Yugoslavian Literatures. 4 Hours. May be repeated for a total of 8 hours of credit. Specific topics are announced each term. Prerequisite: Graduate standing.

440. Studies in the Serbian Novel. 4 Hours. Major novelists of the nineteenth and twentieth centuries.

442. Studies in Serbian Drama. 4 Hours. Major dramatists from 1800 to the present.

444. Studies in Serbian Poetry. 4 Hours. Major poets from approximately 1850 to the present.

448. Ivo Andric. 4 Hours. Critical analysis of his major novelistic and short story endeavors.

450. Njegos. 4 Hours. Critical analysis of his major lyric, epic, and dramatic works.

452. Ukrainian Drama of the Twentieth Century. 4 Hours. Offered in Ukrainian. Outstanding plays. Prerequisite: Consent of the instructor.

454. Ukrainian Poetry: 1920 to 1970. 4 Hours. Offered in Ukrainian. Outstanding works of modern and contemporary poetry. Prerequisite: Consent of the instructor.

456. The Ukrainian Novel: 1930 to 1970. 4 Hours. Offered in Ukrainian. Reading and interpretation of the major works of modern Ukrainian novelists. Prerequisite: Consent of the instructor.

460. Ukrainian Romantic and Post-Romantic Poetry. 4 Hours. Offered in Ukrainian. Poets of the nineteenth and early twentieth century, excluding T. Sevcenko, L. Ukrainka, and I. Franko. Prerequisite: Consent of the instructor.

462. Ukrainian Romantic and Realist Prose. 4 Hours. Offered in Ukrainian. Major prose authors of the nineteenth and early twentieth century, excluding Franko. Prerequisite: Consent of the instructor.

464. Ukrainian Renaissance and Baroque Literature. 4 Hours. Literature of the Kozak and Hetmanscyna periods. Prerequisite: Consent of the instructor.

465. Taras Sevcenko. 4 Hours. Intensive study of the works of the leading Ukrainian Romantic poet. Prerequisite: Graduate standing.

470. History of the Ukrainian Language. 4 Hours. Formation and development of standard Ukrainian from its beginnings to the present. Analysis of selected texts. Prerequisite: Slav 410.

472. Ukrainian Linguistics and Poetics. 4 Hours. Selected problems in the development of the Ukrainian language as evidenced in literary styles. Analysis of texts against the background of contemporary Western theories of stylistics and poetics. Prerequisite: Graduate standing.

482. History of the Czech Language. 4 Hours. Formation and development to the middle of the nineteenth century. Analysis of selected texts. Prerequisite: Slav 410.

484. Seminar on Czech Linguistics. 4 Hours. May be repeated for a total of 8 hours of credit. Specific topics are announced each term. Prerequisite: Graduate standing.

485. Early Czech Literature. 4 Hours. From the beginnings of the

Enlightenment. Prerequisite: Graduate standing.

486. Studies in Czech Romanticism. 4 Hours. Major authors and movements from 1830 to 1860. Prerequisite: Graduate standing.

487. Studies in Czech Realism. 4 Hours. Major authors and movements from 1860 to 1914. Prerequisite: Graduate standing.

488. Studies in Modern Czech Literature. 4 Hours. Major authors and movements from 1914 to the present. Prerequisite: Graduate standing.

490. Independent Study for Graduate Students. 1 to 6 Hours. May be repeated for up to a total of 12 hours of credit. Investigation of special problems under the general direction of a staff member. Prerequisite: Consent of the head of the department.

POLISH

Courses for Graduate and Advanced Undergraduate Students

301. Advanced Polish Conversation and Composition I. 4 Hours. Development of oral and writing skills: expanding vocabulary, developing style. Aural comprehension practice. Prerequisite: Pol 203 or the equivalent.

302. Advanced Polish Conversation and Composition II. 4 Hours. Continues Polish 301. Prerequisite: Pol 301 or the equivalent.

303. Advanced Polish Conversation and Composition III. 4 Hours. Continues Polish 302. Prerequisite: Pol 302 or the equivalent.

340. Polish Romanticism. 4 Hours. Polish-Russian literary relationship during the Romantic period; major works of Mickiewicz, Slowacki, Krasinski, and Norwid. Prerequisite: Junior standing.

341. The Polish Novel. 4 Hours. Major works from the eighteenth century to the present. Emphasis on Krasicki, Sienkiewicz, Prus, Orzeszkowa, Zeromski, Nalkowska, Dabrowska. Prerequisite: Junior standing.

342. Polish Drama. 4 Hours. Major plays of Fredro, Mickiewicz, Slowacki, Krasinski, Wyspianski, Witkiewicz, Gombrowicz, Mrozek. Prerequisite: Junior standing.

399. Independent Study. 1 to 4 Hours. Investigation of special problems under the general direction of a staff member. Prerequisite: Consent of the instructor and the head of the department.

Courses for Graduate Students

405. Structure of Modern Polish. 4 Hours. A synchronic linguistic analysis of Polish substantives, pronouns, verbs, deverbal nouns, and minor parts of speech from a syntagmatic and paradigmatic point of view. Prerequisite: Slav 310.

406. Polish Linguistics and Poetics. 4 Hours. Linguistic and stylistic analysis of Polish texts based on contemporary theories of style. Prerequisite: Graduate standing.

407. Seminar on Polish Linguistics. 4 Hours. May be repeated for a total of 8 hours of credit. Specific topics are announced each term. Prerequisite: Graduate standing.

410. Polish Renaissance and Baroque Literature. 4 Hours. Comparative study of the most significant trends in the poetry and prose of the two periods.

412. Polish Classicism and Romanticism. 4 Hours. Esthetic concepts of Polish literature in the second half of the eighteenth and first half of the nineteenth centuries. Major tendencies, features, and works.

415. History of the Polish Language. 4 Hours. Phonological and morphological development; emphasis on lexical, syntactical, and stylistic problems. Linguistic analysis of selected texts. Prerequisite: Slav 410.

420. Polish Positivism and Young Poland. 4 Hours. The specific Polish variants of European realism and symbolism in the second part of the nineteenth and the beginning of the twentieth centuries.

425. Twentieth-Century Polish Literature in Poland and Abroad. 4 Hours. The Polish literary scene during the Second Independence (1919 to 1939) and postwar (1945 to 1965) periods.

450. Mickiewicz, Slowacki, and Norwid. 4 Hours. The three greatest Polish poets of the Romantic era analyzed through their most outstanding works.

455. **Sienkiewicz, Zeromski, and Reymont. 4 Hours.** Three leading Polish novelists of the late nineteenth and early twentieth centuries considered as upholders of the traditional and promoters of the modern concepts of the novel.
470. **Polish Literary Criticism in the Nineteenth and Twentieth Centuries. 4 Hours.** Major developments in Polish pre-Romantic, Romantic, positivist, modernist, and contemporary periods.
490. **Independent Study for Graduate Students. 1 to 6 Hours.** May be repeated for up to a total of 12 hours of credit. Investigation of special problems under the general direction of a staff member. Prerequisite: Consent of the head of the department.

RUSSIAN

Courses for Graduate and Advanced Undergraduate Students

301. **Advanced Russian Conversation and Composition I. 4 Hours.** The development of oral and writing skills: vocabulary building, style development; aural comprehension practice. Prerequisite: Russ 203 or the equivalent.
302. **Advanced Russian Conversation and Composition II. 4 Hours.** Continues Russian 301. Prerequisite: Russ 301 or the equivalent.
303. **Advanced Russian Conversation and Composition III. 4 Hours.** Continues Russian 302. Prerequisite: Russ 302 or the equivalent.
307. **Methodological Problems in Russian Instruction. 4 Hours.** Analysis and discussion of special methodological problems connected with the teaching of Russian. Prerequisite: Russ 203 or the equivalent.
320. **Russian Poetry: 1750 to 1830. 4 Hours.** Lomonosov, Derzhavin, Krylov, Pushkin, and others. Prerequisite: 24 hours of Russian.
321. **Russian Poetry: 1840 to 1890. 4 Hours.** Zhukovsky, Lermontov, Nekrasov, Tyutchev, Fet, and others. Prerequisite: 24 hours of Russian.
322. **Russian Poetry: 1890 to the Present. 4 Hours.** Bely, Blok, Akhmatova, Mandelstam, Yesenin, Mayakovsky, Pasternak, Yevtushenko, Voznesensky, and others. Prerequisite: 24 hours of Russian.
324. **Studies in Nineteenth-Century Russian Literary Criticism. 4 Hours.** Belinsky, Chernyshevsky, Herzen, Dobrolyubov, Pisarev, L.N. Tolstop. Prerequisite: Slav 224.
327. **Russian Decadence and Symbolism. 4 Hours.** Poetry and prose from 1890 to 1910. Birusov, Sologub, Balmont, Belyi, Blok, and others. Prerequisite: 24 hours of Russian.
332. **Problems in Russian Grammar. 4 Hours.** May be repeated once for credit. Required for Russian teaching majors. Intensive study and review of problems of Russian grammar and syntax. Prerequisite: Russ 201.
350. **The Russian Novel to 1860. 4 Hours.** Pushkin, Lermontov, Gogol, Goncharov, Chernyshevsky. Prerequisite: Junior standing.
351. **The Russian Novel: 1860 to 1900. 4 Hours.** Turgenev, Saltykov-Shchedrin, L.N. Tolstoy, Dostoevsky. Prerequisite: Junior standing.
352. **The Russian Novel: 1900 to the Present. 4 Hours.** Gorky, Zamyatin, Sholokhov A.N. Tolstoy, Ehrenburg, Pasternak, Bulgakov, Solzhenitsyn. Prerequisite: Junior standing.
360. **Nineteenth-Century Russian Drama. 4 Hours.** Major dramatists from Griboedov, Chekhov. Prerequisite: Slav 224 or consent of the instructor.
361. **Twentieth-Century Russian Drama. 4 Hours.** Major authors from Gorky to the present. Prerequisite: Slav 224 or consent of the instructor.
399. **Independent Study. 1 to 4 Hours.** Investigation of special problems under the general direction of a staff member. Prerequisite: Consent of the instructor and the head of the department.

Courses for Graduate Students

401. **Structure of Modern Russian. 4 Hours.** A synchronic linguistic analysis of Russian substantives, adjectives, pronouns, verbs, deverbals,

nouns, and minor parts of speech from a syntagmatic and paradigmatic point of view. Prerequisite: Slav 310.

403. **Russian Linguistics and Poetics. 4 Hours.** Linguistic and stylistic analysis of Russian texts based on contemporary theories of style. Prerequisite: Graduate standing.

405. **Seminar on Russian Linguistics. 4 Hours.** May be repeated for a total of 8 hours of credit. Specific topics are announced each term. Prerequisite: Graduate standing.

411. **History of the Russian Language. 4 Hours.** Formation and development of standard Russian to the end of the eighteenth century. Analysis of selected texts. Prerequisite: Slav 410.

440. **Pre-Nineteenth-Century Russian Literature. 4 Hours.** Kievan, provincial, and Muscovite literatures; poetry and drama from 1730 to 1800; beginnings of Russian prose; theoretical treatises on prosody. Kantemir, Trediakovsky, Lomonosov, Sumarkov, Fonvizin, Karamzin, and others.

450. **Pushkin and Lermontov. 4 Hours.** Analysis of major lyrics, narrative poems, dramas, and prose.

455. **Gogol and Dostoevsky. 4 Hours.** Critical study of the major novels and short stories.

460. **Turgenev and Tolstoy. 4 Hours.** Analysis of major works; emphasis on the evolution of artistic and philosophical ideas and their impact on Russian literature.

465. **Chekhov and Gorky. 4 Hours.** Critical study of the drama and major prose of both authors in light of the Russian prerevolutionary intellectual and esthetic currents.

475. **Prose Literature of the Soviet Period. 4 Hours.** Historical and critical study of literature since the October Revolution.

480. **Russian Poetry: 1910 to 1930. 4 Hours.** Acmeist, futurist, and imagist verse. Akhmatova, Mandelstam, Maiakovskii, Esenin, Pasternak, and others.

485. **Russian-Polish Literary Relations in the Nineteenth and Twentieth Centuries. 4 Hours.** Affinities between Mickiewicz and Pushkin; the Polish and Russian novel in the twentieth century; Polish and Russian symbolists; the Skamanderites and acmeists; the ego-futurists and cubo-futurists.

490. **Independent Study for Graduate Students. 1 to 6 Hours.** May be repeated for up to a total of 12 hours of credit. Investigation of special problems under the general direction of a staff member. Prerequisite: Consent of the head of the department.

SOCIAL WORK

Shirley M. Buttrick, Dean of the Jane Addams College of Social Work

Robert Weagant, Associate Dean

Almera Lewis, Dean of Students

Professors: Shirley M. Buttrick, Sumati Dubey, Harvey Tregger, Robert Weagant, Imogene Young, Sidney E. Zimbalist

Associate Professors: Claire M. Anderson, H. Frederick Brown, Patricia A. Brown, Stephen Z. Cohen, Robert T. Constable, Eloise J. Cornelius, James Forkeotes, Joseph R. Godwin, Joy Johnson, Kenneth Krause, Baruch Levine, Almera Lewis, Edwin A. Marksman, Ord Matek, Judith Nelson, Joan Shireman, Dorothy R. Young

Assistant Professors Harold S. Goldman, Sally Goren, Philip Jackson, Regina Kulys, Clarence Lipschutz, F. Dean Luse, William Meezan, Ruth Meyer, Seymour Mirelowitz, Nancy Mudrick, Marilyn M. Salomon, Barbara Wickell

Instructors: Carmen Rivera-Martinez

Lecturers: Eddie Davis, Larry Hagen, Jeanore Parham

The Jane Addams College of Social Work offers programs of professional study leading to the Bachelor of Social Work, the Master of Social Work, and the Doctor of Social Work.

Master of Social Work

The two-year master's program is designed to give students the knowledge, skills, attitudes, and philosophy basic to all professional social work practice rather than merely to prepare them for positions in specific agencies.

For selected students, plans have been developed to spread the degree program over a longer period.

Much of the first-year program is mandatory and is made up of those courses considered generic to all aspects of social work practice. The first-year courses generally include social work methods, welfare policy and services, an overview of community organization practice, social work research, human growth and behavior, and field instruction. The second year consists of required and elective courses in all of the major concentrations—social treatment, administrative policy and organization, and research—that allow the student to pursue individual career interests. In both years an extensive field experience in agency practice is required. Field work is generally concurrent with class work in the social treatment concentration. Students in the APO concentration may have a block placement.

Advanced Standing. Students who hold a BSW from the Jane Addams College of Social Work will be given a waiver of up to 39 quarter hours if they receive grades of B or better in courses equivalent to or parallel to those taken for the MSW.

Students holding baccalaureates from other accredited BSW programs may be given a waiver of up to 39 quarter hours of credit by proficiency examination or transfer of credit for courses equivalent to or parallel to those taken for the MSW.

Since enrollment is limited and new students are admitted only in the fall quarter, early application is advisable. A limited number of scholarships and fellowships are available through the college.

A bulletin about the college and application forms may be obtained by writing the Jane Addams College of Social Work, University of Illinois at Chicago Circle, Box 4348, Chicago, Illinois 60680. A separate College of Social Work application is required.

Admission Requirements

Regular Admission. Applicants are considered on an individual basis and must complete a separate Jane Addams College of Social Work application. They must have a baccalaureate from an accredited college or university and a grade point average of at least 3.75 (A=5.00) on the final 90 quarter hours (60 semester hours) of undergraduate study. The baccalaureate should include at least 30 quarter hours in the social sciences, including courses in social research methods and statistics. Transcripts from all colleges attended are required. Evidence of personal suitability for a career in social work is also a requirement. A brief personal statement of the student's interest in the profession of social work must be submitted with the application form. In addition, three letters of recommendation should be submitted. Applicants whose transcripts do not indicate objective evidence of academic proficiency, i.e., letter grades or equivalents, are required to submit scores of the Graduate Record Examination (verbal, quantitative, and analytical). For applicants whose undergraduate grade point average is below the required minimum, the college recommends the Graduate Record Examination to enhance admissibility.

Nondegree Admission. Nondegree candidates will be admitted only as space permits. Applicants must submit the baccalaureate transcript and a letter stating the preferred courses to the college's Office of Student Affairs, 4329 Education and Communications Building.

Degree Requirements

Hours. Candidates must complete 96 quarter hours of graduate work, including work in each of the four general areas (human growth and behavior, social work practice, welfare policy and services, and social research). A cumulative grade point average of at least 4.00 is required.

Residence. A minimum of 12 quarter hours must be earned at the University of Illinois at Chicago Circle in each of three consecutive terms.

Thesis. A thesis is optional. Not less than 8 and not more than 16 quarter hours may be counted toward the degree requirements. The thesis must be defended before a committee appointed by the Dean of the Graduate College on the recommendation of the Jane Addams College of Social Work.

Transfer of Credit. A maximum of 48 hours of credit may be transferred for work taken elsewhere.

Time Limit. All requirements must be completed within six years. Military service is deducted. Exceptions may be made only in unusual circumstances.

Doctor of Social Work

The doctoral program is designed to increase the number of persons who have advanced knowledge and skills to develop and direct social welfare programs, as well as to advance social work theory and research. It provides preparation for leadership in teaching, research, policy analysis and development, and administration of large-scale social welfare organizations.

The program is interdisciplinary and strongly emphasizes research. Anthropology, economics, education, sociology, psychology, public health, urban planning, law, industrial and labor relations, political science, and management are areas of particular importance for advanced education in social work. The program provides for two principal divisions or broad tracks of study: social planning policy administration and social work treatment theories and research. While the preponderance of a student's training will normally be in one of these two divisions, some course work is required in both.

Students should choose an area of specialization within one of these two divisions, such as selected facets of

information systems for community planning, community mental health, social policy for the aged, program evaluation, treatment process research, and child welfare administration. Training in advanced clinical practice is *not* provided.

The student is encouraged to select and develop a dissertation topic as soon as feasible, preferably within the first three terms of residence. It should have significance for social work theory, policy, or practice.

A full-time student enrolls for a minimum of 12 hours per term. An optimal load is considered to be 16 hours per term. The option of beginning the program on a part-time basis is available to holders of the Master of Social Work. Initially, a part-time student may take less than 12 hours of credit per term, usually 8 hours per term. Part-time students are expected to start their programs of study with the required core courses.

Study at the other campuses of the University of Illinois, especially at Urbana-Champaign, which has a similar doctoral program, is encouraged.

Since the Doctor of Social Work is a highly individualized program, interested persons should communicate with the chairperson of the doctoral program for additional information.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) on the final 90 quarter hours (60 semester hours) of undergraduate study. Most applicants are expected to have the Master of Social Work, although this is not required. Students with advanced training in other human service professions or in related social sciences are also eligible for consideration. Applicants must have a grade point average of at least 4.00 on all work beyond the baccalaureate and must submit scores on the Miller Analogies Test and the Graduate Record Examination (verbal, quantitative, and advanced), prior to admission. Applicants are expected to have had course work in research and statistics. Applicants should submit a brief statement of their interest in doctoral study, including career plans, a proposed area of specialization, an indication of the related social science field in which study would likely be undertaken, and a resume or summary of educational background and work experience. In addition, three to five letters of reference from persons in a position to appraise the applicant's potential for advanced study will be solicited. Submission of formal papers written by the applicant is desirable.

Applications are considered for fall quarter admission only. Thus, applications should be submitted early and no later than March 15. Inquiries and requests for application forms and instructions may be obtained by writing to the chairperson of the doctoral program.

Degree Requirements

1. A minimum of 144 quarter hours of course work and research beyond the baccalaureate is required. At least 18 of these hours must be in the core curriculum and at least 24 of these hours must be in courses outside of the Jane Addams College of Social Work. At least half of the latter should be in one discipline.

2. *Core Curriculum:* Social Work 480—Proseminar on Social Work; Social Work 481—Theory Building in Social Work Treatment; Social Work 483—Social Welfare Policy Analysis and Development; Social Work 491—Social Work Research Models and Knowledge Building; Social Work 492—Quantitative Methods in Social Work Research.

3. *Residence.* A minimum of 12 quarter hours must be earned at the University of Illinois at Chicago Circle in each

of three consecutive terms. In special circumstances students may be permitted to enroll for 8 quarter hours in each of three consecutive terms. Students are expected to complete the residence requirement before beginning the dissertation.

4. A social work practicum or equivalent training is required for candidates who do not have the Master of Social Work.

5. A preliminary examination on substantive knowledge and a dissertation proposal are required.

6. A dissertation based on original research or scholarly analysis of a professional problem or issues is required. It must be defended before a committee appointed by the Dean of the Graduate College on the recommendation of the Jane Addams College of Social Work.

Note: Many of the courses listed below are open to students not admitted to the Jane Addams College of Social Work only with the consent of the instructor.

Courses for Graduate and Advanced Undergraduate Students

300. Methods of Social Work Intervention I. 2 to 4 Hours. The basic concepts of social casework, social group work, and combined methods. Analysis and study of underlying philosophy, values, and principles. Skills used in working with groups, individuals, and families. Staff, Fall.

305. Education Policy for Citizens. 4 Hours. Same as Education 305. The concepts and information that all citizens need to participate effectively as education consumers and policy affectors. History, economics, basic statistics, sociology, research, and current and future trends affecting American education at all levels. Prerequisite: Consent of the instructor.

310. Methods of Social Work Intervention II. 4 Hours. The philosophy, concepts, processes, and methods of social work intervention with families and groups. Prerequisite: SocW 300.

321. Social Work Practice Seminar I. 2 Hours. Focus on initial contacts in the helping process; collecting information and problem assessment. The sequence 321-322-323 parallels the senior field placement. Prerequisite: SocW 326. Staff, Fall.

322. Social Work Practice Seminar II. 2 Hours. Establishment of goals in the helping process; selection and use of methods of intervention; reactions of the social worker throughout the helping process. Prerequisite: SocW 321. Staff, Winter.

323. Social Work Practice Seminar III. 2 Hours. Sustaining of a helping process; shifts in the process, termination and ending process, assessment and evaluation. Prerequisite: SocW 322. Staff, Spring.

325. Community Organization. 2 to 4 Hours. Principles, concepts, and methods of community organization in social work at the neighborhood, local, state, national, and international levels. Staff, Fall, Winter, Spring.

326. Social Work Practice with the Community. 2 Hours. Emphasizes methods useful to social workers in community problem-focused practice, including strategies, tactics, and techniques of organizing, planning, policy-making, and administration. Prerequisite: SocW 310. Staff, Spring.

330. Field Experience. 2 to 4 Hours. Participation in a social agency's service without the responsibility involved in professional social work practice. Prerequisites: Junior standing, SocW 200, and consent of the instructor.

331. Field Instruction I. 3 to 6 Hours. Satisfactory/unsatisfactory only. Student is assigned to a social agency where, under the supervision of a field instructor, he carries selected cases or groups for direct service to the agency clientele. Prerequisite: Consent of the instructor.

332. Field Instruction II. 3 to 6 hours. Satisfactory/unsatisfactory grade only. Student is assigned to a social agency where, under the supervision of a field instructor, he carries selected cases or groups for direct service to the agency clientele. Prerequisite: Consent of the instructor.

333. Field Instruction III. 3 to 6 hours. Satisfactory/unsatisfactory grade only. Student is assigned to a social agency where, under the supervision of a field instructor, he carries selected cases or groups for direct service to the agency clientele. Prerequisite: Consent of the instructor.

341. Individual Development and Facilitating Environment. 4 Hours. The psychosocial development of the individual from infancy through adulthood and the environmental influences affecting this development with some reference to minority status and ethnicity. Organized and presented as a base for social work practice. Prerequisite: SocW 200. Staff, Fall.

342. Dynamics of Group Relations for Social Work Practice. 2 Hours. The first course in the theories of small group dynamics and processes and their relevance for social work practice. Focus on models of group development, feedback; functional roles; problem-solving; structure; conflict arrangement; norms and values; and patterns of communication. Prerequisite: SocW 341 or 442. Staff, Spring, Fall.

343. Dynamics of Family Relations for Social Work Practice. 2 Hours. Examines family theory in light of historical perspectives and current trends. Presents a frame of reference and a process of evaluating major schools of family theory and research. Evaluates implications of these theories for social work treatment and planning. Prerequisite: SocW 341 or 442. Staff, Spring, Fall.

349. Majority and Minority Cultural Interaction. 2 to 4 Hours. Same as Urban Planning and Policy 438. Critical examination of the nature and development of status and economic factors likely to be important in accounting for majority and minority cultural interaction. Analysis of various conditions under which competition with minorities may or may not result in discrimination. Implications of this analysis for social work practice and the role of the professional social worker. Staff, Fall, Winter, Spring.

366. Sociology of Mental Disorders. 3 Hours. Same as HC 366 (School of Public Health). Sociocultural variations involved in mental illness. Social epidemiology of mental illness, patient career cycle, societal labeling and stigma, and community aspects of mental health. Prerequisite: One basic sociology course or HC 300 (School of Public Health).

367. Sociology of Mental Retardation. 3 Hours. Same as HC 367 (School of Public Health). Sociocultural aspects involved in mental retardation. Social epidemiology of retardation, family adjustment problems, patient career cycle, and community relations. Prerequisite: One basic sociology course or HC 300 (School of Public Health).

370. The Social Service Agency: Structure and Environment. 4 Hours. Analysis of outcome, operations, and relations with community environment of social service agencies. Provides a frame of reference for understanding the broader community, policy, and agency components of social service delivery. Prerequisites: SocW 200 and consent of the instructor. Staff, Fall.

371. Social Services and Welfare Policy I. 2 to 4 Hours. The function, nature, and scope of the social welfare institution. Social services as a response to social, personal, and economic problems of people. Effects of economic and social growth and change on the welfare enterprise. Staff, Fall.

372. Social Services and Welfare Policy II. 2 to 4 Hours. Current provisions and alternatives for their solution in the social security and money assistance programs. Prerequisite: SocW 371. Staff, Winter.

394. Social Work Research. 4 Hours. Application of basic concepts of research methodology to social work, including problem formulation, research design, measurement, sampling, and data analysis. Critique of selected studies of social work research and direct experience with original data. Prerequisite: 4 hours of social research and statistical methods.

Courses for Graduate Students

401. Social Casework I. 2 to 4 Hours. Analysis and study of the underlying philosophy, concepts, generic principles, and methods of social casework; role of the caseworker in offering service through a professional relationship. Staff, Fall.

402. Social Casework II. 2 to 4 Hours. Continues development of social casework concepts and principles through analysis of case material from secondary settings. Psychological and cultural factors

that affect the treatment process. Analysis of the interconnectedness of relationship, study-diagnosis, and treatment phases of social casework. Prerequisite: SocW 401. Staff, Winter.

404. Selected Treatment Methods. 3 to 6 Hours. Intensive study of particular applications of social work practice. Theory base and skill development in the use of methods. Typical sections in family diagnosis and treatment, crisis intervention, advanced casework, and interrelated treatment models. Prerequisites: SocW 401, 402; SocW 442. Staff, Fall, Winter, Spring.

405. Treatment Methods with Families. 3 to 6 Hours. May be repeated. Social treatment methods adapted to helping families confronted by stress and special problems; families of the mentally or physically ill, inner-city families; treatment of the family as a unit. Prerequisites: SocW 343, 401, 402; SocW 442. Staff, Fall, Winter, Spring.

406. Social Work Treatment with Children. 3 to 6 Hours. May be repeated for credit. Specific characteristics of direct strategies and techniques applicable to problems of children. Individual and group methods as related to identified needs and problem areas. Prerequisites: SocW 401, 402; SocW 442. Staff, Fall, Winter, Spring.

407. Consultation and Supervision in Social Work. 3 to 6 Hours. May be repeated. Theory and practice relevant to the delivery of social work services and the enhancement of social work practice; supervision in practice and consultation in social treatment. Prerequisites: SocW 401, 402, 442. J.D. Johnson, Wickell, Spring.

408. Treatment Theories in Social Work. 2 to 4 Hours. May be repeated. Theories and constructs utilized in social treatment; significance and applicability to practice. Theories of psychotherapy; therapeutic group work; variables based on schools of thought, such as transactional analysis, behaviorism, and others. Prerequisites: SocW 401, 402; SocW 442. Staff, Winter, Spring.

411. Social Group Work I. 2 to 4 Hours. Group work methods, with focus on the worker's problems and procedures in understanding the group, its objectives, and its relationship to the agency. Basic formulation of the worker's role in reference to assessment, interaction, and small-group theory. Prerequisites: SocW 342, 401, 402, 442.

413. Social Group Work III. 2 to 4 Hours. The integration of concepts in the worker's role with the individual and the group; the referral processes. The worker's role as a strategy in intervention is developed. Prerequisites: SocW 342, 401, 402, 411, 442. Staff, Spring.

414. Social Group IV. 2 to 4 Hours. Advanced principles of work in direct service with the groups, advanced group theory, and concepts of group stress and crisis situations. The development of criteria for analysis of the worker's role. Prerequisite: SocW 413. B. Levine, Fall.

418. Social Work Treatment with Adolescents. 3 to 6 Hours. May be repeated. Intensive study of social treatment models used with adolescents; presenting problems; phases of development of individual and group approaches with adolescents and families. Prerequisite: SocW 401, 402; SocW 442. Cornelius, J.D. Johnson, Fall, Spring.

419. The Adolescent and His Family Group. 3 Hours. Diagnostic understanding of the adolescent and the family group with which he lives. Developmental study of the growth of families, the impact of an adolescent on the family system, and the impact of the family system on the adolescent. Both normal and abnormal development are considered. Prerequisites: SocW 342, 343, 401, 402, 442. J.D. Johnson, Fall.

427. Practice in Settings for Children and Adolescents. 3 to 6 Hours. May be repeated. Practice with children and adolescents in such settings as residential treatment, schools, and child welfare agencies. The impact of the setting on clients. Implications for function, planning, and provisions of services. Prerequisites: SocW 401, 401, 442. Cornelius A. Lewis, Matek, Fall, Winter, Spring.

428. Psychosocial Pathology at Life Cycle Stages. 3 to 6 Hours. May be repeated. Diagnostic formulation and social work treatment patterns for various emotional disorders and illnesses that occur in childhood, adolescence, and maturity. Prerequisite: SocW 442. Forkeotes, Matek, Nelsen, Fall, Winter, Spring.

434. Field Instruction IV. 4 to 8 Hours. Satisfactory/unsatisfactory grade only. The student is assigned to a social agency where, under the supervision of a field instructor, he carries selected cases or groups for direct service to the agency clientele. Prerequisite: Credit or concurrent registration in SocW 405 or 411. Staff, Fall.

435. Field Instruction V. 4 to 8 Hours. Satisfactory/unsatisfactory grade only. The student is assigned to a social agency where, under the supervision of a field instructor, he carries selected cases or groups for direct service to the agency clientele. Prerequisite: Credit or concurrent registration in SocW 405 and 411. Staff, Winter.

436. Field Instruction VI. 4 to 8 Hours. Satisfactory/unsatisfactory grade only. The student is assigned to a social agency where, under the supervision of a field instructor, he carries selected cases or groups for direct service to the agency clientele. Prerequisite: Credit or concurrent registration in an advanced methods course. Staff, Spring.

438. Practice Laboratory. 4 to 8 Hours. Students and faculty team with community organizations or agencies in problem-solving projects. Development of specific plans, program proposals, or evaluation reports. Focus on beginning practice skills. Prerequisite: SocW 337. Staff, Fall, Winter, Spring.

439. Externship in Community Practice. 8 to 12 Hours. Intensive field experience under professional supervision in a community organization or planning agency in conjunction with faculty-led practice seminars. Externships provide a range of skill development in community organization and planning practice. Prerequisite: SocW 438 or 433. Staff, Fall, Winter, Spring.

442. Human Growth and Behavior II. 3 to 6 Hours. The individual's growth and behavior from early through late adulthood. The essential developmental tasks and central conflicts for each major life phase, with focus on differentiating kinds of knowledge about personality and social functioning. Prerequisite: SocW 341. Staff, Winter, Spring.

443. Human Growth and Behavior III. 3 to 6 Hours. The nature and dynamics of social society—the family, class, ethnic group, and caste—and on the manner in which they influence individual personality development. The process of interaction and the meaning of membership within small groups. Role expectations and the dynamics of small-group membership, particularly in the family. The continuous process of change in group life and its effect on behavior. Prerequisite: SocW 442. Staff, Fall, Winter, Spring.

444. Treatment Aspects of Rehabilitation. 2 to 4 Hours. Study and analysis of the impact of catastrophic illness, disease, and rehabilitation procedures on the individual and his family; emphasis on the role of the social worker. Prerequisite: SocW 401, 402, 442. Staff, Spring.

445. Advanced Studies in Psychosocial Development. 3 to 6 Hours. May be repeated. Psychosocial development at specific age levels. Various approaches to personality theory and social work practice. Advanced ego psychology. Psychosocial factors in aging. Prerequisite: SocW 442. Fall, Winter, Spring.

446. Analysis and Study of Problems of the Aging. 3 Hours. The physical, psychic, and economic aspects of aging, with reference to the contribution of ego psychology and certain social sciences theories. The relevance of such study to the provision of social services to individuals and groups and the planning of comprehensive health services. Prerequisite: SocW 442 or consent of the instructor and the student's adviser. S.Z. Cohen, Fall.

447. Human Sexuality: Social Work Applications. 2 to 4 Hours. How sexuality develops and is manifested and how it serves as an expression of self-image in normal and maladjustive behavior. Teaching of the skills in dealing knowledgeably and sensitively with sexual concerns to help students feel more comfortable with their professional role in dealing with the intimate interactions of persons. J.D. Johnson, Matek, Fall, Spring.

448. Drug and Alcohol Abuse and Social Work Practice. 3 to 6 Hours. May be repeated. Major classes of drugs and other abused substances. Factors related to drug abuse. Treatment methods, legal controls. Dynamics of alcoholism as a social problem; social work treatment implications. Prerequisites: SocW 401, 402, 442. Matek, Winter.

452. Community Development. 2 to 4 Hours. Same as Urban Planning and Policy 440. Community development theory and practice are analyzed and evaluated with given practitioner roles, community resources, client systems, and other means of change and development as affected by a variety of social, cultural, political, economic, geographic, and historical considerations, both foreign and domestic. Emphasis on the conditions students are likely to encounter in actual practice. Prerequisite: SocW 451. Marksman, Fall, Spring. F. Brown, Winter.

453. Community Planning. 2 to 4 Hours. Same as Urban Planning and Policy 434. A range of approaches to community planning; special emphasis on their application to the development and implementation of social welfare programs. Various levels of planning and their relationship to other planning professions. Professional skills included are those pertaining to technical data collection, political processes, grantsmanship, citizen involvement, advocacy roles, and models for evaluation. Prerequisite: Consent of the instructor. Marksman, Fall. F. Brown, Winter.

461. Special Studies in Social Work. 2 to 6 Hours. Independent or group study in areas of special interest; application of social work principles to special problems or settings. Staff, Fall, Winter, Spring.

470. Principles of Social Welfare Administration. 2 Hours. Theories, principles, and processes of social service administration; the organization of service delivery, especially the practice of direct social work methods. Emphasis on the roles of social welfare administrators and practitioners in primary and host settings. Structure and functions of social service organizations. Prerequisite: SocW 372.

472. Social Welfare Organizations. 2 Hours. Organizational theory and its application to the social welfare institution. The unique attributes of the human service organization; the interface between professional and bureaucratic roles. Prerequisite: SocW 372.

473. Social Services and Welfare Policy III. 2 to 4 Hours. Continues Social Work 372. Prerequisite: SocW 372. Staff, Spring.

474. Administration Theory in Social Welfare. 2 to 4 Hours. Theories of administration that affect behavior of organizations and behavior in organizations. Application of organization and administrative theory to social work practice and social welfare services. Prerequisite: SocW 473.

476. Problems and Practices in Social Welfare Administration. 2 to 4 Hours. Analysis of problems in social work administration and critical examination of extant practices in social agencies. Prerequisite: SocW 475.

477. Concepts, Problems, and Issues in Social Policy and Administration. 2 to 4 Hours. May be repeated for up to 16 hours of credit. Significant concepts, social problems, and issues analyzed and evaluated from the perspectives of social welfare policy and administration; affirmed social work value orientations; relevant empirical research and model practices. Typical sections: corrections, aging, mental health, child welfare, and social casework. Prerequisite: SocW 473.

480. Proseminar on Social Work. 2 to 4 Hours. May be repeated with the consent of the instructor. Analysis and critique of the current state of knowledge, research, and trends in selected areas of social work theory and practice, including social treatment and social planning. Stress is on selected recent developments and the potentialities for significant study and innovation. Prerequisite: Admission to the program for the Doctor of Social Work. Staff, Fall, Spring.

481. Theory Building in Social Work Treatment. 4 Hours. Concepts and constructs of social work treatment. Overview of models followed by investigation of selected treatment theories. Prerequisite: Admission to the program for the Doctor of Social Work. Staff.

483. Social Welfare Policy Analysis and Development. 4 Hours. Seminar. The common domain and key processes of social welfare policies; development of conceptual models and factors affecting policy evolution; derivation of a framework for study; application of the models to specific social welfare problems; the implications for social and political action. Prerequisite: Admission to the program for the Doctor of Social Work. Staff.

490. Evaluative Research on Social Services Effectiveness. 4 Hours. Review and assessment of empirical research on the results of social service intervention; concepts, criteria, and methodology of such research; the state of knowledge concerning effectiveness of social services and areas of further inquiry; the application of theory and research tools from allied disciplines. Prerequisite: SocW 494. Zimbalist, Spring.

491. Social Work Research Models and Knowledge Building. 2 to 4 Hours. The function of research in social work. Knowledge-building processes and the contribution of several research models to the growth of knowledge. Prerequisite: Admission to the program for the Doctor of Social Work.

492. Quantitative Methods in Social Work Research. 4 Hours. Se-

lected quantitative methods and statistical procedures that are particularly important to the conduct of social work research; application to illustrative problems and data, including survey sampling and hypothesis testing; nonparametric techniques; regression and multivariate analysis. Prerequisite: Admission to the program for the Doctor of Social Work.

493. Social Research. 2 to 4 Hours. Objectives of social research, design of experiments, and measurement and methods of collecting data.

495. Research Seminar: Social Service Issues. 2 to 4 Hours. Methodologies and results of research in selected fields and methods of social services; special issues and problems in practice; relationship of research, theory, and practice; priorities for future research. Prerequisite: SocW 494. Staff, Fall, Winter, Spring.

496. Research Seminar: Social Welfare Manpower Development and Utilization. 2 to 4 Hours. The social welfare manpower system and the demand, supply, and utilization of subsystems. Recruitment, organization, function, development, and evaluation of staff and the concepts of professionalization and new careers. Review of empirical research, agency experience, conceptual models, and manpower planning efforts. Prerequisites: SocW 433, 473, 494. C.M. Anderson, Winter.

497. Research Seminar: Methodologies in Social Work Research. 2 to 4 Hours. Selected research techniques; assessment, application, innovation. Systems analysis; social indicators; planning, programming, and budgeting systems; cost-benefit analysis; evaluative research; case analysis methods; cybernetics; information systems. Prerequisite: SocW 494. Staff, Fall, Winter, Spring.

498. Research Project. 0 to 12 Hours. Application of research methods to a social work problem in an individual or group project or a library research project conducted by an individual student. Preparation of a formal report based on field study processes and findings. Prerequisite: SocW 494. Staff, Fall, Winter, Spring.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Satisfactory/unsatisfactory grade only. Individual research, under faculty direction, on social work problems. Prerequisites: SocW 494 or the equivalent and consent of the thesis adviser. Staff, Fall, Winter, Spring.

SOCIOLOGY

David P. Street, Head of the Department
Wayne J. Villemez, Director of Graduate Studies

Professors: C Norman Alexander, Jr., Bernard H. Baum,* M. Rue Bucher, James T. Carey, David B. Carpenter, Robert E. Corley, Helen K. Grace,* Robert L. Hall, Richard J. Jensen (Adjunct), John W.C. Johnstone, Roger W. Little, William T. Liu, Mildred A. Schwartz, Ethel Shanas, David P. Street, Richard Videbeck

Associate Professors: Daniel J. Amick, Pauline B. Bart, Kathleen S. Crittenden, Fredrick DuBow, William W. Erbe, Weldon T. Johnson, John W. Martin, Gary Schwartz (Adjunct), Wayne J. Villemez, Richard B. Warnecke, R. Stephen Warner

Assistant Professors: William P. Bridges, Robert M. Cabral, Phyllis A. Ewer, Mary L. Fennell, Cheryl B. Leggon, David F. Luckenbill, Helen R. Miller, James L. Norr, Masako Osako (Adjunct), Diana M. Pearce, Dennis W. Roncek, David M. Rubinstein, Mary Glenn Wiley

* Principal appointment at the University of Illinois at the Medical Center.

The department offers work leading to the Master of Arts and the Doctor of Philosophy. Graduate training is geared to decision-relevant research associated with the urban nature of contemporary society. The location of the University in the heart of a major metropolitan area is significant in providing unique opportunities for research and a laboratory setting for the study of urban problems. Graduate students receive intensive training in a variety of empirical methods, utilizing the University's excellent research facilities.

The program for the Master of Arts is in general sociology. It provides basic familiarity with the concepts, techniques, and substance of three broad subfields: social organization, social psychology, and demography and human ecology. Students receive comprehensive grounding in modern research-oriented sociology; pursue course work in social organization, social psychology, population and human ecology, and statistics; and participate in a three-term theory and research practicum program in which faculty and students jointly design, conduct, and analyze a large-scale research project.

The PhD program in sociology prepares students for research and advanced teaching. Students develop a program of study within either social psychology, medical sociology, or the sociology of political and economic organization, with opportunities for further specialization. Possible subareas might include occupational socialization, utilization of health care facilities and services by the aged, economic factors in family decision-making, socialization into delinquent careers, leadership and ideology in social movements, and changes in occupational structure of urban society. The three general areas of concentration all benefit from close ties with allied units within the University.

Admission Requirements

Work in logic, philosophy of science, mathematics, and statistics as well as sociology is strongly recommended. Admission preference is given to students who have completed such work.

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. In exceptional cases, students who have averages of less than 4.00 but above 3.75 or who do not have a strong undergraduate preparation in sociology may be

admitted if they can show evidence of substantial promise of ability to complete the program successfully. Such students may be admitted on limited status and will be required to remedy department deficiencies before being admitted to regular status. Complete transcripts of undergraduate (and any graduate) work are required.

Submission of scores from the Graduate Record Examination (verbal and quantitative test and the advanced test in sociology) is required. The advanced test in sociology is used as an aid in advising students but is not a factor in admission.

Students who have completed some graduate study elsewhere, in addition to the above requirements, must offer a grade point average of at least 4.50 in previous graduate study.

The department accepts applications for nondegree admission from those who have a baccalaureate from any accredited college or university.

Degree Requirements

Master of Arts

Hours. 48 quarter hours, including 12 hours in Sociology 400, 401, 402—Theory and Method in Sociology; 4 hours in sociological theory at the 300 level; 8 hours in seminars at the 400 level; and Sociology 302.

Comprehensive Examination. A candidate must satisfactorily complete a comprehensive examination.

Thesis. A thesis is not required.

Doctor of Philosophy

Hours. 144 quarter hours beyond the bachelor's degree or 96 hours beyond the master's degree.

In addition to satisfying the general requirements of the Graduate College, students must complete graduate courses, selected in consultation with the student's major adviser, that include Sociology 400, 401, and 402, 16 hours in sociology seminars at the 400 level (beyond the bachelor's degree), and 8 hours in sociological theory at the 300 or 400 level and may include 24 hours of courses outside of sociology if the adviser approves. Students must successfully complete a qualifying examination in general sociology, given at the discretion of the department, and a preliminary examination in their area of specialization. PhD candidates must present evidence acceptable to the examining committee of (a) supervised experience in empirical research, including the use of more than one major research technique; (b) successful experience in the clear presentation of sociological materials to students; (c) a systematic written review of research and theory within a circumscribed area of sociology; (d) an organized oral research presentation to sociological colleagues; (e) competence in a special skill or cognate field relevant to research; and (f) competence in statistics equivalent to completion of Sociology 303 with a grade of B.

Thesis. Candidates must prepare a dissertation based upon empirical research.

Courses for Graduate and Advanced Undergraduate Students

300. Exploratory Social Data Analysis. 4 Hours. 3 hours of lecture-discussion, 2 hours of laboratory per week. Introduction to the analysis of social data; relationship between data analysis and measurement operations; transformations of data; construction of indices; graphic display of data; analysis and interpretation of residuals. Prerequisites: Soc 201, 202, and 4 hours of upper-division sociology.

301. Sociological Statistics. 4 Hours. 3 hours of lecture, 2 hours of laboratory per week. Intended primarily for graduate students and

advanced undergraduate sociology majors. Introduction to statistical tests of sociological hypotheses; estimation procedures; selected statistical procedures commonly used in sociology. Prerequisites: Soc 201 and 202. Nonmajors must have the consent of the instructor. Fall, Spring.

302. Advanced Statistics in Sociology. 4 Hours. Analysis of contingency tables; multiple and partial, linear and nonlinear correlation; analysis of variance. Prerequisite: Soc 301. Winter.

303. Advanced Analytical Models in Sociology. 4 Hours. Advanced models for analysis of complex sociological data using matrix operations, exploratory and confirmatory factor analysis, multivariate analysis of variance, and discriminant and classification analysis. Prerequisite: Soc 302. Spring.

305. Research Techniques in Sociology. 4 Hours. 3 hours of lecture-discussion, 2 hours of laboratory per week. Several common techniques of collecting and organizing sociological data, such as questionnaires and interview schedules, systematic observation, scaling, nonreactive measures, content analysis, observation in natural settings. Prerequisites: Soc 201, 202, or the equivalent and consent of the instructor.

306. Research Design in Sociology. 4 Hours. Formulation of researchable problems; designing research procedures and selecting techniques to fit particular objectives; planning controls to distinguish among alternative hypotheses. Prerequisites: Soc 201 and 202 or consent of the instructor.

309. Topics in Sociological Research. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of a specialized topic, announced when the class is scheduled. Prerequisites: Soc 201 and 202 or consent of the instructor.

314. Social Psychology of Organizations. 4 Hours. Sociological analysis of the mutual influence of individuals and social organizations through such organizational processes as recruitment, socialization, interaction, innovation, and social control. The entire range of social organizations is considered, such as politics, social movements, communities, bureaucracies, families, gangs, friendships, encounters. Prerequisites: Soc 210 or the equivalent and 4 hours of upper-division sociology or psychology, or consent of the instructor.

316. Adult Socialization. 4 Hours. Socialization as a process of induction into new roles, which occurs throughout the life cycle; the process is analyzed at both social-psychological and social-systems levels with illustrations from various settings, such as marriage and family, illness, migration, and particularly socialization into occupations and professions. Prerequisite: 8 hours of upper-division sociology or psychology, or consent of the instructor.

318. Sociology of Literature. 4 Hours. How literature is influenced by and in turn influences social forces; effects of social class, political and economic factors, and religious, ethnic, and racial affiliations on literary works; attitudes of writers, relationships to publics, reward systems, and related matters. Prerequisites: 4 hours of upper-division sociology and 6 hours of literature (any department), or consent of the instructor.

319. Topics in Social Psychology. 4 Hours. May be repeated for up to 16 hours of credit. Intensive analysis of a specialized topic, announced at the time the class is scheduled. Prerequisites: Soc 110 or 210 and 8 hours of upper-division sociology or consent of the instructor.

325. Age Groups and the Social Order. 4 Hours. The relation of age groups to social structure; the demographic, sociological, and social-psychological conditions affecting the salience of age as a basis of social organization; recent writings on adolescents and youth; the theory of subcultures as applied to youth groups; relations between generations; current directions in the study of youth groups, both conventional and deviant. Prerequisites: 8 hours of upper-division sociology, including 201, or consent of the instructor.

326. Race and Ethnic Relations. 4 Hours. Critical examination of the conceptual frameworks for studying race and ethnic relations. Prerequisite: 8 hours of upper-division sociology, including Soc 225.

327. Topics in Race and Ethnic Relations. 4 Hours. May be repeated for up to 12 hours of credit. Intensive examination of a specialized topic, announced at the time the class is scheduled. Prerequisite: 8 hours of upper-division sociology, including Soc 225.

333. Sociology of Law. 4 Hours. Same as Criminal Justice 333. The origin and development of legal norms in various social settings; their relationship to custom and incorporation in legal and quasi-le-

gal institutions; special attention to the difference between legal and sociological reasoning; law as an instrument of social change. Prerequisite: 8 hours of upper-division sociology, including Soc 230; or CrJ 206, 230; or consent of the instructor.

335. Topics in Deviance and Social Control. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of a specialized topic in the sociology of law, deviance, and social control. Each topic is announced at the time the class is scheduled. Prerequisite: 8 hours of upper-division sociology, including Soc 230 or CrJ 230, or consent of the instructor.

341. Social Stratification and Classes. 4 Hours. Nature and systems of differentiation and ranking in societies, emphasis on class structure in the United States; life chances, prestige, status, power, and social mobility in the United States and other societies. Prerequisite: 8 hours of upper-division sociology, including Soc 201, or consent of the instructor.

343. Topics in the Sociology of Education. 4 Hours. May be repeated for credit up to a total of 12 hours of credit. Intensive examination of a specialized topic, announced each time the course is scheduled. Prerequisites: 8 hours of upper-division sociology or consent of the instructor.

344. Industrial Sociology. 4 Hours. Same as Management 344. Analysis of industrial institutions in contemporary society; management, labor, and the community. Prerequisite: 8 hours of sociology.

345. The Sociology of the Family. 4 Hours. The family as a social institution; its functions and forms in contemporary society. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

346. Sociology of Science. 4 Hours. Organization of the scientific enterprise; emergence of science as a social institution; interrelations with other institutions, such as government, religion, economy, and the arts. Science as a social phenomenon; regularities in scientific behavior; historical and contemporary material. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

347. Sociology of Complex Organizations. 4 Hours. Same as Management 347. Characteristics of business, government agencies, schools, hospitals, and other large-scale organizations; approaches used to study organizations; theoretical and empirical analysis of organizational processes. Prerequisite: 8 hours of upper-division sociology, management, or political science or consent of the instructor.

348. Topics in the Sociology of War. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of selected topics, including comparative military organization, the relationships between military institutions and other institutions of the larger society, and their roles in social conflict and change. Prerequisite: 8 hours of either sociology, political science, history, or economics or consent of the instructor.

349. Sociology of Occupations and Professions. 4 Hours. Theoretical and empirical analysis of the occupational structure and occupational mobility processes in American and other industrial societies; patterns of recruitment and retention in occupations and professions. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

351. Medical Sociology. 4 Hours. Same as Urban Planning and Policy 351. Sociological contributions to medicine and public health; social organization and the organization of health services; the sociology of illness. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

352. Social Epidemiology: Social and Cultural Factors in Health and Disease. 4 Hours. The methods of social epidemiology as they apply to chronic and acute disease; psychosocial factors in illness; individual and social reactions to health and disease. Prerequisites: Soc 201, 351, or consent of the instructor.

353. Health Care Systems. 4 Hours. The organization of medical care in the United States and other selected countries. Methods of delivering medical care to various populations; emphasis on urban medicine. Prerequisite: Soc 351 or consent of the instructor.

354. Urban Medicine. 2 Hours. Same as Preventive Medicine and Community Health 399B (College of Medicine). A combination of preceptorship and seminar-discussion for advanced clinical students; several models of the urban health care setting are examined by direct participation; seminar topics evaluate the nature of and factors contributing to each of the study models; critical observation and evaluation of special-interest areas, such as private practice, group

practice, private hospital, public hospital, health department and public health programs, health care plans, neighborhood health centers, and others as student interest dictates. Prerequisite: Consent of the instructor.

355. Topics in Medical Sociology. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of the methods and literature in a selected subfield of medical sociology. Each topic is announced at the time the class is scheduled. Prerequisite: Soc 351 or consent of the instructor.

357. Field Experience in Medical Sociology. 2 to 12 Hours. Field placement in a medical institution for sociology students. Critical observation and the application of sociological concepts in the study of special-interest areas, such as the role of the patient, patient-doctor relationship, and socialization into the health professions. Prerequisites: 12 hours of upper-division sociology, including Soc 351, or consent of the instructor.

361. Social Gerontology: Old People in America. 4 Hours. The aged; demographic trends, economic status, physical and social needs, family relationships. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

365. Topics in the Sociology of Politics. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of a specialized topic concerning the sociological study of politics. Each topic is announced at the time the class is scheduled. Prerequisite: 8 hours of upper-division sociology or consent of the instructor. Sociology 265 is recommended.

366. Community Power Structure. 4 Hours. Analysis of the power structure of American communities; special emphasis on the relation between theoretical assumptions and research procedures in current community studies. Prerequisite: Soc 203.

371. Population I. 4 Hours. 2 hours of lecture, 2 hours of laboratory-discussion per week. Primarily for sociology majors and graduate students. The measurement and study of major trends and differentials in fertility, mortality, population growth, and age-sex composition in the United States and other countries. Emphasis on social and cultural determinants and consequences. Prerequisite: 8 hours of upper-division sociology, including Soc 201, or consent of the instructor.

372. Population II. 4 Hours. 2 hours of lecture, 2 hours of laboratory-discussion per week. The measurement and study of major trends in migration, population composition, and marriage and divorce in the United States and other countries; theories and policies regarding population growth in relation to resources; population forecasting. Prerequisite: Soc 371. Winter.

373. Human Ecology. 4 Hours. The relationship between man and the natural environment. Emphasis on importance of population patterns and human institutions in adaptation. Prerequisite: 8 hours of upper-division sociology, including Soc 201, or consent of the instructor.

375. Topics in Population and Human Ecology. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of a specialized topic on population or human ecology, announced at the time the class is scheduled. Prerequisite: 8 hours of upper-division sociology including Soc 201, consent of the instructor.

376. Topics in Urban Sociology. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of a specialized topic, announced at the time the class is scheduled. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

381. Topics in Social Change. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of a specialized topic on processes of social change, announced at the time the class is scheduled. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

384. Topics in Sociological Theory Construction. 4 Hours. May be repeated for up to 12 hours of credit. Intensive analysis of various contemporary topics. Prerequisites: Soc 201, 202.

385. History of European Sociological Theory. 4 Hours. European foundations of modern sociology from the French Revolution through the aftermath of World War I, with emphasis on selected European theorists who have had a strong impact on modern sociology. Their works are viewed both analytically and historically. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

386. History of American Sociological Theory. 4 Hours. American

foundations of modern sociology from the Civil War to World War II, with emphasis on selected American theorists who have had a strong impact on contemporary sociology. Their works are viewed both analytically and historically. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

387. Contemporary Sociological Theory. 4 Hours. Issues and thinkers associated with the development of sociological theory since World War II, presented analytically and in terms of the social context in which it was written. Stress on the implications of this recent work for future research. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

389. Independent Study or Research. 2 to 12 Hours. May be repeated for credit with the approval of the department. Projects for graduate students or undergraduate students with senior standing; may consist of extensive readings in specialized areas of sociology or empirical research. Prerequisites: 24 hours of sociology (excluding Soc 289 and 299), consent of the instructor, and approval of the department.

395. Topics in Social Organization and Institutions. 4 Hours. May be repeated for up to a total of 12 hours of credit. Intensive analysis of a specialized topic. Prerequisite: 8 hours of upper-division sociology or consent of the instructor.

Courses for Graduate Students

400. Theory and Method in Sociology I. 4 Hours. Required of all graduate majors. May be taken out of sequence with the consent of the instructor. Detailed examination of middle-range theories, such as compliant behavior, status congruence, and intervening opportunities in migration; the means of bringing evidence to bear on them. Emphasis on the link between theoretical assertions and data. Prerequisite: Consent of the instructor. Winter.

401. Theory and Method in Sociology II. 4 Hours. Required of all graduate majors. Continues Sociology 400. May be taken out of sequence with the consent of the instructor. Prerequisite: Soc 400. Spring.

402. Theory and Method in Sociology III. 4 Hours. Required of all graduate majors. Continues Sociology 400 and 401. May be taken out of sequence with the consent of the instructor. Prerequisite: Soc 401. Spring.

404. Research Methods Practicum. 2 to 6 Hours. May be repeated with the approval of the department. Supervised experience in the use of specialized techniques of sociological research. The topic is announced when the class is scheduled. The practicum is usually offered in a three-term sequence. Prerequisite: Consent of the instructor.

409. Seminar: Sociological Research Methods. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of specialized topics. Prerequisite: Consent of the instructor.

411. Small Groups: Structure and Process. 4 Hours. Same as Psychology 411. Systematic survey of research and theory dealing with social interaction and social relationships in small groups; primary groups as agents of social influence and social control. Prerequisite: Consent of the instructor.

419. Seminar: Social Psychology. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of special topics. Prerequisite: Consent of the instructor. Fall.

429. Seminar: Sociological Theory. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of specialized topics. Prerequisite: Consent of the instructor.

439. Seminar: Deviance and Social Control. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of specialized topics. Prerequisite: Consent of the instructor.

449. Seminar on Social Organization. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of specialized topics. Prerequisite: Consent of the instructor. Fall.

459. Seminar: Sociology of Medicine. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of special topics. Prerequisite: Consent of the instructor.

469. Seminar: Sociology of Politics. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of special topics. Prerequisite: Consent of the instructor.

476. Seminar: Sociology of Urban Life. 2 to 6 Hours. May be

repeated for credit up to a total of 16 hours. Intensive analysis of specialized topics. Prerequisite: Graduate standing in sociology.

479. Seminar: Population and Human Ecology. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of special topics. Prerequisite: Consent of the instructor.

489. Seminar: Social Institutions. 2 to 6 Hours. May be repeated for credit up to a total of 16 hours. Intensive analysis of specialized topics. Prerequisite: Consent of the instructor.

490. Colloquium on College Teaching of Sociology. 4 Hours. Sociological analysis of contemporary university teaching; specific information and techniques for the presentation of sociology at the college level. Prerequisite: One term of graduate study.

498. Supervised Research in Sociology. 2 to 8 Hours. May be repeated for credit. Research on special problems not included in a graduate thesis. Prerequisites: Consent of the instructor and approval of the department.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit.

SPANISH

Audrey Lumsden-Kouvel, Acting Head of the Department
Jerry R. Rank, Director of Graduate Studies

Professors: Eduardo Betoret-Paris, Ramon Cerda-Masso, Ruth El Saffar, Audrey Lumsden-Kouvel

Associate Professors: Manuel Blanco-Gonzalez James Maharg, Klaus Mueller-Bergh

Assistant Professors: Lucille Braun, Jerry R. Rank

The department offers an MA in Hispanic studies. Three options are offered Hispanic interdisciplinary studies, Hispanic literary studies, and Hispanic linguistics.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate with a major in Spanish from an accredited college or university in this country or the equivalent from a foreign university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of study. In exceptional cases, students who do not meet these requirements or who have averages between 3.75 and 4.00 may be considered if in the opinion of the department they show evidence of substantial promise of ability to complete the program successfully. Those whose undergraduate preparation is deemed inadequate will be required to take supplementary course work on the undergraduate level without credit. Three letters of recommendation from former professors, of which preferably at least two are from teachers in upper-level Spanish courses, are required. Applicants are urged to take the Graduate Record Examination, including both the aptitude test and the advanced test in Spanish.

In addition, applicants will be asked to demonstrate satisfactory performance in a department qualifying examination before being admitted to graduate study. The examination tests accuracy and comprehension in formal standard Spanish and presupposes no specific previous course work.

At the time of application, prospective students should indicate their choice of one of the three master's options in a letter of intent of about 250 words presenting their reasons for desiring to take graduate work in Spanish and in the option selected.

Applicants for entry into graduate studies under a non-degree status must possess a baccalaureate and submit transcripts from institutions where a degree or academic credit was earned during the last eight years. Admission to non-degree status does not obligate the Graduate College or the department to admit a student to a degree program.

Degree Requirements

1. *Qualifying Examination.* Given at the end of each term, this examination must be passed by the end of the second term of study in order for a student to be recommended for the MA program. Students who plan to take the qualifying examination at the time of application are urged to make arrangements as early as possible. The qualifying examination may be attempted twice.

2. *Programs of Study.*

Option A: Hispanic Literary Studies—56 quarter hours

Core Sequence: Spanish 400, 490, and 372 or the equivalent (16 hours).

Department electives: 32 quarter hours selected by the candidate in consultation with the graduate adviser.

Extrdepartment electives: 8 quarter hours at the graduate level, selected by the candidate in consultation with the graduate adviser.

Option B: Hispanic Interdisciplinary Studies—56 quarter hours

Core Sequence: Spanish 400, 402, and 372 or the equivalent (14 hours).

If three courses of the sequence 301-304 or the equivalent have not been completed before admission to graduate studies, these will also form part of the core sequence.

Department electives: 22 quarter hours selected by the candidate in consultation with the graduate adviser, to be distributed in Spanish-American or Peninsular literature, consonant with the component chosen above.

Extrdepartment electives: 20 quarter hours at the graduate level, selected by the candidate in consultation with the graduate adviser.

Option C: Hispanic Linguistics—56 quarter hours

Core Sequence: Spanish 400, 373, and 374 (14 hours).

Linguistics 305, or the equivalent, must be completed before beginning the core sequence.

Department electives: 26 hours selected by the candidate in consultation with the graduate adviser, to include at least one seminar in Hispanic linguistics.

Extrdepartment electives: 16 hours at the graduate level selected in consultation with the graduate adviser.

3. *Final Comprehensive Examinations.* These are normally taken immediately after the completion of course work and may be attempted twice.

Courses for Graduate and Advanced Undergraduate Students

301. **Golden Age Literature and Society. 4 Hours.** The main genres, figures, and works in relation to their cultural background, social significance, and influences. Readings include *Lazarillo de Tormes*, poems of Garcilaso de la Vega, selections from Fray Luis de Leon, and examples of the Golden Age *comedia*. Prerequisites: Span 202, 203.

302. **Modern Spanish Literature and Thought. 4 Hours.** An overview of Spanish literature from the end of Romanticism to the out-

break of the Civil War. Readings from Becquer, Antonio Machado, Valle Inclán, Unamuno, Lorca. Prerequisites: Span 202, 203.

303. **Spanish-American Literature and Society I. 4 Hours.** An overview of Latin American literature from the sixteenth century to modernism. Works selected from the "cronistas," Sor Juana Inés de la Cruz, representative authors on the enlightenment, Martí, and the first modernists. Prerequisites: Span 202, 203.

304. **Spanish-American Literature and Society II. 4 Hours.** Continues Spanish 303. From modernism to the present, including selections from Dario, Nerudo, Borges, Marquez. Prerequisites: Span 202, 203.

305. **Medieval Spanish Literature and Society I. 4 Hours.** Representative figures and literary works from the beginnings to 1350 considered in their social, cultural, and literary setting: the *Cid*, the *Libro de buen amor*, selected works of Berceo, Alfonso X, and Juan Manuel. Prerequisites: Span 202, 203.

306. **Medieval Spanish Literature and Society II. 4 Hours.** Continues Spanish 305. Literary, social, and cultural developments from 1350 to 1500, including poetry from the *Cancionero*, the sentimental novel, and the *Celestina*. Prerequisites: Span 202, 203.

308. **Golden Age Prose I. 4 Hours.** Development of the picaresque and pastoral novel; *Lazarillo de Tormes*, *La Diana*, and other representative works. Prerequisite: Span 301.

309. **Golden Age Prose II. 4 Hours.** Major prose forms of the sixteenth and seventeenth centuries. Readings include works of Santa Teresa, Cervantes, Quevedo. Prerequisite: Span 301.

310. **Don Quijote. 4 Hours.** Emphasis on novelistic technique and the development of the novel. Prerequisites: Span 202, 203.

311. **Golden Age Drama I. 4 Hours.** Origins and development of the Golden Age *Comedia*. Detailed study of selected plays of Lope de Vega and his contemporaries. Prerequisite: Span 301.

312. **Golden Age Drama II. 4 Hours.** Continues Spanish 311. Detailed study of plays of Calderon and other representative dramatists of the seventeenth century. Prerequisite: Span 301.

315. **Poetry of the Golden Age I. 4 Hours.** Lyric poetry of the sixteenth century in the learned and popular traditions. Thematic and stylistic studies of the poetry of Garcilaso de la Vega, Fray Luis de Leon, and San Juan de la Cruz. Prerequisite: Span 301.

316. **Poetry of the Golden Age II. 4 Hours.** Continues Spanish 315. Emphasis on the poetry of the Spanish Baroque: *conceptismo* and *culteranismo*, the poetry of Gongora, Quevedo, and their contemporaries. Prerequisite: Span 301.

320. **Spanish Romanticism. 4 Hours.** Origins in the eighteenth century. Development in relation to historical and cultural influences in Spain and Europe. Representative works by Moratin, Martinez de la Rosa, duque de Rivas, Zorrilla, Larra. Prerequisites: Span 202, 203.

321. **The Spanish Novel of the Nineteenth Century. 4 Hours.** Representative novels of Spanish realism and regionalism; emphasis on the works of Galdos. Prerequisite: Span 302.

322. **The Spanish Novel of the Twentieth Century. 4 Hours.** The Spanish novel since Galdos, including works by Baroja, Cela, Delibes, Goytisolo, Martin Santos. Prerequisite: Span 302.

325. **Modern Spanish Poetry I. 4 Hours.** Major poets from the end of Romanticism to the "generation of 1927," including Becquer, Antonio Machado, and Juan Ramon Jimenez; Prerequisites: Span 202, 203.

326. **Modern Spanish Poetry II. 4 Hours.** Continues Spanish 325. Poetry of Garcia Lorca and the "generation of 1927," the "generation of 1936," and the *posguerra*. Prerequisites: Span 202, 203.

330. **Hispanic Theater of the Twentieth Century. 4 Hours.** Representative plays of major dramatists of Spain and Spanish America, including Benavente, Arrabal, Florencio Sanchez, and Usigli. Prerequisites: Span 202, 203.

335. **The Essay in Latin America. 4 Hours.** Historical and critical study of the development of the Spanish-American essay from the turn of the century to the present. Works by Rodo, Gonzalez Prada, Alfonso Reyes, Octavio Paz. Prerequisites: Span 202, 203.

338. **The Modernist Movement in Spanish America. 4 Hours.** Emphasis on the concept of *modernismo* in poetry and prose from 1888, including Ruben Dario and his influence. Prerequisite: Span 304.

339. **Contemporary Spanish-American Poetry. 4 Hours.** Continues Spanish 338. Emphasis on poetry from 1920 to the present. Analysis

of poems by Huidobro, Vallejo, Neruda, Parra, and others. Prerequisite: Span 304.

341. Studies in Peninsular Languages. 4 Hours. May be repeated for credit. Dialects and languages of the Iberian Peninsula, including Catalan, Galician, Aragonese, Leonese. Topic varies from term to term. Prerequisite: Span 340 or an equivalent course in any Romance language or approval of the department.

342. Introduction to Romance Philology. 4 Hours. Same as Italian 342. History of the Romance languages, especially Spanish, French, Italian, and Portuguese, from the classical Latin period to the present; their external history, phonology, morphology, and syntax. Prerequisite: Consent of the instructor.

345. Spanish-American Novel I. 4 Hours. Development from the post-Romantic period to early vanguard; emphasis on the work of Larreta, Rivera, Azuela, Guiraldes, Gallegos. Prerequisite: Span 304.

346. Spanish-American Novel II. 4 Hours. Continues Spanish 345. From early vanguard to the present. Major novelists, such as Yanez, Asturias, Carpentier, Cortazar, Sabato. Prerequisite: Span 304.

361. Spanish Abroad. 0 to 17 Hours. May be repeated for credit for a maximum of 51 hours. Lectures, seminars, and practical work in Spain. Spanish language, literature, and civilization. Prerequisites: Span 214 or the equivalent; Span 218, 219 or the equivalents; 3.50 overall average; 4.00 average in Spanish courses.

370. Topics in Linguistics and Language Training in Spanish. 4 Hours. May be repeated for a maximum of 8 hours of credit. Topics vary. Prerequisites: Span 216, 254 or consent of the instructor.

371. Spanish for Teachers. 4 Hours. Consideration of those language problems suggested by teaching experience. It is recommended that this course be taken after student teaching, in the last term before graduation. Also open to experienced teachers. Prerequisite: Student teaching or professional teaching experience.

372. Topics in the Languages of the Hispanic World. 4 Hours. May be repeated for a maximum of 8 hours of credit. Topics vary. Prerequisite: Span 216 or consent of the instructor.

373. Topics in Romance Linguistics. 4 Hours. May be repeated for a maximum of 8 hours of credit. Same as Italian 373. Topics vary. Prerequisites: Span 216, 254 or Ital 349 or consent of the instructor.

374. Topics in Spanish Linguistics. 4 Hours. May be repeated for a maximum of 8 hours of credit. Topics vary. Prerequisite: Span 216 or consent of the instructor.

375. Foreign Language Computer-Assisted Instruction. 4 Hours. Same as French 385, German 340, and Slavic Languages and Literatures 340. Does not count toward the major. Basic introduction to the use of the TUTOR language and the PLATO IV system in foreign language instruction. Each student designs and implements an instructional module as a term project. Prerequisite: Completion of the intermediate level, or the equivalent, of either Spanish, French, German, or a Slavic language.

376. Spanish Translation. 3 Hours. Practical study of methods and techniques required for idiomatic translation of Spanish to English and English to Spanish. Prerequisite: Span 213 or consent of the instructor.

390. Topics in Hispanic Language and/or Literature. 4 Hours. May be repeated for a maximum of 12 credit hours. Specific topics are announced in advance. Prerequisite: Two 300-level courses in Spanish.

399. Student-Initiated Independent Study. 1 to 6 Hours. May be repeated for a maximum of 8 hours of credit. Designed to provide for an area of study or emphasis not regularly covered by department offerings. The student must initiate this course by presenting a study proposal with a minimal bibliography to the department for approval and appropriate direction. Prerequisites: Spanish major with senior standing or graduate student in Spanish and approval of the department.

Courses for Graduate Students

400. Introduction to Graduate Study. 6 Hours. May be repeated for a maximum of 12 hours of credit. Textual analysis, literary criticism, and research methods. Prerequisite: Admission to the graduate program.

401. Applied Linguistics and Language Training in Spanish, Italian, and Portuguese. 4 Hours. Systems of linguistic analysis in

relation to language teaching via programmed instruction, audio-visual aids, television, radio, and computer-based instruction. Practical work is required in problem areas. Prerequisite: Fluency in a Romance language.

402. Introduction to Latin American Studies. 4 Hours. May be repeated for a maximum of 8 hours of credit. Problems inherent in the concept of Latin American studies; national versus regional and Continental values; indigenous, *mestizo*, and *criollo* versus European; *hispanidad* in Latin America and the effects of non-Spanish immigration and cultural influences. Prerequisite: Consent of the instructor.

490. Special Seminar. 6 Hours. Topic varies. Prerequisite: Two 300-level courses in Spanish or approval of the department.

491. Independent Study. 1 to 6 Hours. May be repeated for credit. Available only after 18 hours of graduate credit. Study, under a graduate faculty member, of an area not otherwise available. Prerequisite: Consent of the graduate chairperson.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Individual work under the supervision of a graduate faculty member. Prerequisite: Approval of the department graduate committee.

SYSTEMS ENGINEERING

Irving F. Miller, Acting Head of the Department
Gyan C. Agarwal, Director of Graduate Studies

Professors: Gyan C. Agarwal, Joseph H. Engel, Richard M. Michaels, David C. Miller, William D. O'Neill

Associate Professors: Michael Maltz, Floyd G. Miller

Assistant Professors: Arshad M. Khan, Allen R. Levin

The Department of Systems Engineering offers work leading to the Master of Science in Systems Engineering. Areas of specialization are offered in industrial engineering, engineering management, operations research, systems analysis, and urban systems engineering (with subareas such as transportation systems engineering, health delivery systems, environmental health engineering systems, and criminal justice systems). Students are required to obtain a broad understanding of the interface of technology with society so that in their professional careers they will have the flexibility to respond to rapid changes in sociotechnological problems.

Admission Requirements

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university, preferably with an undergraduate major in industrial engineering, operations research, systems analysis, or systems engineering. Practicing engineers who wish to return to school for advanced study and students with undergraduate majors in other engineering, scientific, or quantitatively oriented curricula, including holders of baccalaureates in economics, engineering management, administrative science, or business administration, are also encouraged to apply.

Applicants must have a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study and must submit three letters of recommendation from teachers or others familiar with their academic training or professional experience. Applicants with baccalaureates from institutions outside the United States and Canada must submit test scores on the Graduate Record Examination (verbal and quantitative tests).

In exceptional cases, students with grade point averages of less than 4.00 but above 3.75 may be admitted if they can

show evidence of substantial promise of being able to complete the program successfully. Submission of Graduate Record Examination scores is recommended for such applicants. If admitted, such students will be placed on limited status and will not be considered for regular status until they have removed departmental deficiencies or have completed at least 16 quarter hours of graduate work with a grade point average of 4.00 or better.

Degree Requirements

At least 48 quarter hours of approved graduate work are required.

1. At least three systems engineering courses (12 quarter hours), excluding Systems Engineering 499—Thesis Research, must be at the 400 level. At least two of these courses must be chosen from:

System Engineering 411—Systems Theory I

Systems Engineering 445—Statistical Systems Modeling of Time Series

Systems Engineering 451—Decision Theory

Systems Engineering 460—Theory of Transportation Networks

Systems Engineering 471—Operations Research Seminar

2. Completion of either Option 1 or Option 2.

Option 1: The student completes a thesis containing original research and defends it before an examining committee appointed by the Dean of the Graduate College. The student receives credit for at least 8 but not more than 16 quarter hours of Systems Engineering 499—Thesis Research.

Option 2: The student completes a written report on a research design or reading project that must be approved at an oral examination administered by a committee appointed by the director of graduate studies. The student receives credit for at least 4 but not more than 12 quarter hours of Systems Engineering 495—Individual Research. This option is primarily intended for those students who will not continue their studies beyond the master's degree.

Courses for Graduate and Advanced Undergraduate Students

302. File and Communication Systems. 4 Hours. Same as Information Engineering 302. Functions. File system hardware and organization and structure. Analysis of file systems. Data management systems. Communication system hardware and organization and structure. Analysis of communication systems. Examples of integrated systems. Practical laboratory experience. Prerequisite: InfE 270.

307. Pattern Recognition I. 4 Hours. Same as Bioengineering 307 and Information Engineering 307. The design of automated classification systems. Decision theory. Parametric and nonparametric procedures for the classification of patterned data sets. Clustering and unsupervised learning. Prerequisites: Math 370 or SysE 342, and InfE 270.

315. Dynamic Systems Analysis I. 4 Hours. Mathematical modeling of systems described by ordinary differential and difference equations with application to engineering and sociotechnological systems. Matrix transfer function forms for interacting systems. The Laplace and Z transform methods as applied to specific problems. Solutions for elementary topologies using computer simulations as laboratory experiments. Prerequisites: InfE 210, Math 195, SysE 225. Fall.

316. Dynamic Systems Analysis II. 4 Hours. Computer and analytical modeling of inherently or topologically nonlinear systems described by differential and difference equations. Stability analysis. Laboratory simulation of particular systems. Prerequisite: SysE 315 or InfE 311. Winter.

335. Urban Systems I. 4 Hours. Transportation in metropolitan ar-

eas, application of the systems approach to transportation, urban development forecast models, urban transportation forecast models, data collection procedures for determining urban travel behavior. Prerequisites: SysE 342 or Soc 201 and Math 112; Econ 321 or 120. Fall.

336. Urban Systems II. 4 Hours. Analysis of techniques used in urban systems engineering; emphasis on urban transportation systems and evaluation methodologies for selection of alternative urban system designs. Prerequisites: SysE 335, 371, QM 369. Spring.

337. Urban Transportation Models. 4 Hours. Specific models used in urban transportation studies; structuring transportation model sets, including data management needs and legal constraints. Prerequisites: SysE 335, 371, QM 369. Winter.

338. Urban Transportation Systems Planning. 4 Hours. Evolution of transportation planning in the United States, major transportation planning studies and their methodologies, continuing planning studies, additional planning models. Term planning project. Laboratory. Prerequisites: SysE 337, QM 371. Spring.

340. Construction Engineering. 4 Hours. Same as Materials Engineering 340. Structure of the construction industry and construction projects. Review of the fundamentals and use of network-based systems, such as CPM and PERT, for the planning and control of construction projects. Methods for considering the effect of time and resource limitations on construction cost. Examples of applications taken from the construction, precast-prestressed, and mobile home industries. Prerequisite: Senior standing.

341. Man-Machine Systems. 4 Hours. Same as Bioengineering 341. Specific system areas in which the role of man in the system operation requires a systematic analysis of the human component in the system. Critical concepts, variables, and techniques involved in optimum design of human operated systems. Laboratory experiments on man-machine interactions. Prerequisite: SysE 315 or InfE 311.

342. Experimental Design. 4 Hours. Fundamental concepts of probability and their application to statistical analysis. Introduction to standard experimental designs and their application in the statistical interpretation of research data. Introduction to hypothesis testing. Prerequisites: Math 195, 220. Fall.

345. Statistical Methods in Systems Modeling. 4 Hours. Theory and practice; static and dynamic systems, continuous and discrete models, stochastic and deterministic modeling. Systems applications of least squares and analysis of variance. Simulation laboratory. Prerequisites: SysE 225, 342. Winter.

350. Stochastic Processes. 4 Hours. Description and analysis of probabilistic systems; digital computer simulation of stochastic processes in sociotechnological systems; applications to specific engineering systems. Prerequisite: SysE 342. Fall.

365. Industrial Engineering Methods. 4 Hours. Structure and theory of industrial organization; sales forecasting; investment analysis; plant layout and materials handling; methods analysis; work measurement systems; wage incentives and labor relations; industrial planning and policy development. Prerequisites: SysE 269, 342. Fall.

366. Industrial Engineering Controls. 4 Hours. Microanalysis of industrial processes; quality control; inventory theory; production planning and control; man-machine scheduling models; assembly line balancing; reliability models. Prerequisite: SysE 365. Winter.

367. Industrial Systems Simulation. 4 Hours. The solution of industrial problems by means of computer simulation. Simulation strategies. Planning an industrial simulation experiment. In-depth study of some simulation programming languages as they apply to industrial problems and general examination of their usefulness. Major industrial simulation project. Prerequisites: SysE 269, 350. Winter.

368. Industrial Systems Operations. 4 Hours. Industrial plant organization and labor administration. Industrial engineering as a staff function. Value engineering. Clerical systems analysis. Automation systems. Industrial engineering in the service industries. Course project. Prerequisite: SysE 367. Spring.

371. Optimization Techniques I. 4 Hours. Overview of optimization models and numerical techniques. Formulation of mathematical models of optimization problems relating to industrial processes, urban planning, and network problems. Summary of classical optimization theory, mathematical programming, and optimal control theory. Discussion of the effects of discreteness, nonlinearities, randomness, and competition. Introduction to computerized opti-

mization algorithms, including linear programming. Prerequisites: Math 195, 220, SysE 225. Fall.

372. Optimization Techniques II. 4 Hours. Introduction to the theory and numerical methods in classical optimization, linear programming, and related algorithms, branch-and-bound algorithms, gradient methods, dynamic programming, and optimal control theory, with deterministic illustrations. Prerequisites: Math 195, 220, SysE 225.

373. Optimization Techniques III. 4 Hours. Introduction to formulation and solution of decision problems involving uncertainty, risk, and competition. Optimization techniques as related to utility theory, Bayesian statistics, game theory, and other stochastic models. Illustrations of the use of random experiments to improve decisions and the analysis of probabilistic multistage decision problems. Simulation laboratory. Prerequisites: SysE 342, 371, 372.

378. Computer Graphics I. 4 Hours. Same as Information Engineering 378. Principles of interactive computer graphics. Discussion of display devices, display files, and interactive graphical techniques. Treatment of graphical structures in two dimensions. Practical laboratory experience. Prerequisites: InfE 270, 272.

393. Special Problems. 2 to 4 Hours. Special problems or reading by arrangement with the faculty. Prerequisite: Consent of the instructor. Fall, Winter, Spring.

396. Senior Design I. 4 Hours. Introduction to engineering economics, legal and social constraints on design, safety and reliability theory, and the use of simulation and optimization techniques in the engineering design process. Prerequisites: Senior standing and completion of all core requirements in the College of Engineering. Fall.

397. Senior Design II. 4 Hours. Applications of principles of engineering and engineering design methodology to the solution of a large-scale design problem. Prerequisite: SysE 396. Winter.

Courses for Graduate Students

411. Systems Theory I. 4 Hours. Linear systems theory: state equations formulation, transform methods, structural properties, stability, observability, and controllability. Linear stochastic systems. Prerequisites: SysE 315 or InfE 311, and SysE 342 or Math 370. Spring.

412. Systems Theory II. 4 Hours. Continues SysE 411. Systems theory concepts for systems described by nonlinear, differential and difference equations. Prerequisites: SysE 326, 411.

413. Differential Games and Applications. 4 Hours. Differential games theory as applied to mathematical models of socioeconomic and urban type systems. Optimal strategies are obtained as functions of the state variables, and computer simulations are used to determine optimal trajectories. Prerequisite: SysE 372.

445. Statistical Systems Modeling of Time Series. 4 Hours. Detailed studies of statistical models of systems arising from social, industrial, and engineering environments. Formulation of model structure and parametric representation from data sources. Predictive exercises using estimated and analytic models in simulation forms. Prerequisite: SysE 345. Fall.

450. Applied Stochastic Processes. 4 Hours. The stochastic nature of queues, inventories, and engineering reliability. Comprehensive analysis of queuing systems, Markov chains, and inventory models; engineering analysis of reliability problems. Prerequisite: SysE 350.

451. Decision Theory. 4 Hours. Introduction to the mathematical analysis of decision-making when the state of the world is uncertain but further information about it can be obtained by experimentation. Formal consideration of the decision-maker's knowledge about the application; utility theory. Relation between Bayesian and traditional statistical decision theory. Prerequisite: SysE 350. Spring.

455. Urban Information Systems. 4 Hours. The fundamental informational bases of urban system and subsystem structure, operations, and decision and control; cybernetic urban models, functional aspects of information systems, and operational examples of formalized systems; design of specialized planning information systems, including the establishment and fulfillment of information requirements. Prerequisite: SysE 337.

460. Theory of Transportation Networks. 4 Hours. Establishment of a mathematical basis for network flows and the relation of this basis to combinatorial analysis and graph theory. Static and dynamic maximal flows, multi-terminal flows, and multicommodity flows.



Application of these techniques to such other problems as the trim problem, the warehousing problem, and the allocation-location problem. Prerequisites: SysE 337, 371, 372.

471. Operations Research Seminar. 4 Hours. Review of the status of operations research in major industrial and governmental areas. Applicable examples of the integrated use of various basic and/or recently developed operations research methods. Literature survey project. Prerequisite: SysE 373.

472. Stochastic Optimization. 4 Hours. Development of algorithms that optimize mathematical models involving random variables for coefficients and/or restrictions. Changes necessary in linear programming and dynamic programming methods that allow handling of stochastic problems. Effect of underlying stochastic processes on nature of solution. Prerequisites: SysE 350, 373.

480. Criminal Justice Systems Analysis. 4 Hours. Analysis and design of criminal justice systems. Optimization of criminal justice systems. Analytical models for allocation of police patrol forces. Interaction between police, courts, and corrections. Measures of effectiveness. Prerequisite: SysE 345. Spring.

495. Individual Research. 2 to 4 Hours. May be repeated for a maximum of 12 hours. Research on special problems not included in graduate thesis. Prerequisite: Consent of the instructor. Fall, Winter, Spring.

498. Seminar on Systems Engineering. 2 to 4 Hours. May be repeated for a maximum of 12 hours. Systematic treatment of special topics; emphasis on current research. Prerequisite: Consent of the instructor.

499. Graduate Thesis. 0 to 16 Hours. May be repeated. Thesis work under the supervision of a graduate adviser. Prerequisite: Consent of the adviser. Fall, Winter, Spring.

URBAN PLANNING AND POLICY

Lenora T. Cartright, Acting Director, School of Urban Sciences

Robert E. Mier, Director of Graduate Studies

Professors: Richard F. Babcock (Adjunct), Robert D. Katz, Robert S. Mendelsohn (Adjunct), Richard M. Michaels, Charles J. Orlebeke, Milton A. Pikarsky (Adjunct), Ashish K. Sen, R. Marlin Smith (Adjunct), Alan Voorhees

Associate Professors: Lenora T. Cartright, Robert L. Crowson, Edward M. Levin (Adjunct), Clifford L. Weaver (Adjunct)

Assistant Professors: F. Daniel Cantrell (Adjunct), James F. Foerster, Christine Johnson, Arthur Lyons, Robert E. Mier, Raffaella Nanetti (Visiting), Roger L. Pulliam, Leonard S. Robins

The School of Urban Sciences offers a program of professional study leading to the Master of Urban Planning and Policy and, in cooperation with the Departments of Economics and Political Science and the College of Education, to the Doctor of Philosophy in Public Policy Analysis.

Master of Urban Planning and Policy

The broad goals of the program are those of the School of Urban Sciences: to educate its students to be capable of attacking contemporary urban problems; to provide multidisciplinary interaction among faculty, students, and members of the community; and to promote problem-relevant research.

The specific objectives are: (1) to train professional planners who have the general knowledge and skills required to facilitate more comprehensive planning practice and sound management, with special emphasis on allocative and administrative skills; (2) to provide specialized training in a number of major interrelated fields of urban planning; (3) to encourage research in Urban planning and policy; and (4) to establish an accessible University-based resource for information and evaluation of community efforts directed toward resolving critical urban problems.

Student may elect to specialize in one of four areas: (1) urban policy and community development planning; (2) health services planning; (3) education planning; and (4) transportation planning. Regardless of the area selected, the structure of the overall program is such that the interrelatedness of the problems and needs in each area can be clearly recognized and considered.

Students interested in public agency administration should consult that section of the bulletin for specific information on this program offered in cooperation with the College of Business Administration and the Department of Political Science as part of the Master of Administrative Science program.

The program is divided into four elements:

Core Curriculum

A major portion of the work of the first three terms is designed to provide the student with a basic understanding of contemporary urban policy and planning problems, urban planning theory and methodology, urban history, urban social organization, and analytical and management skills.

Required: 6 courses (24 quarter hours).

Urban Planning and Policy 373—Urban Planning Methods
Urban Planning and Policy 380—Quantitative Skills and Analytical Tools I

Urban Planning and Policy 382—Management and

Administrative Skills I

Urban Planning and Policy 384—History and Theory of Urban Planning and Policy

Urban Planning and Policy 390—Policy and Program Evaluation and Experimental Design

Urban Planning and Policy 405—Urban Models and Planning

Area of Specialization

During each term after the first, the student pursues specialized studies in one of the following areas: (1) urban policy and community development planning, (2) health services planning, (3) education planning, or (4) transportation planning.

Omnibus

During the fifth and sixth terms, the student may participate in an optional intensive multidisciplinary research seminar. In consultation with the faculty, students select seminar topics that emphasize creative and qualitative synthesis of information pertinent to one or more contemporary urban problems. The intent is to provide a laboratory in which students can pool their skills and apply them to an actual planning problem. The omnibus is not a program requirement, but students are encouraged to enter the omnibus research seminar and the omnibus experience may be directed toward the fulfillment of the master's thesis/project requirement.

Field Work/Internship

During either the fourth or the seventh and final term, students are expected to complete ten weeks of professional planning experience. However, this requirement is waived for students with appropriate previous experience.

Admission Requirements

Regular Admission

Generally, prospective students should have the ability to think and write creatively and should demonstrate the potential to identify, define, and formulate alternative solutions to problems by using appropriate methods. Further, the student should demonstrate a basic awareness of critical urban problems and issues.

Applicants are considered on an individual basis. They must have a baccalaureate from an accredited college or university and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. In exceptional cases, students who have averages of less than 4.00 but above 3.75 may be admitted if they can show evidence of substantial promise of ability to complete the program successfully. The program accepts the minimum Graduate College requirement regarding the submission of transcripts.

In addition to a completed Graduate College Application, applicants must submit:

1. A succinct statement describing their educational and career goals, previous pertinent work, and volunteer and/or academic experience.

2. Three letters of recommendation if they have not been submitted in support of an application for a graduate appointment, such as a fellowship, an assistantship, or a tuition-and-fee waiver.

3. A recent paper, essay, or project of which the applicant is the sole author or designer. This material may be of an academic, professional, or personal nature. If the document is in written form, it should be at least 1,000 words in length. It may be an extract from a larger work.

Nondegree Admission

A limited number of nondegree students will be admitted each quarter. The program encourages students to apply for nondegree admission if they wish to take courses for professional development or if they wish to take a few courses before deciding upon a degree program. Nondegree students who later wish to enter the degree program are advised that such a transfer requires that all standards for regular admission must be met, including the requisite undergraduate grade point average.

Degree Requirements

The student is required to complete at least 84 quarter hours for the master's degree. Depending on the student's previous course work, up to 24 hours will be in the core curriculum. At least 24 quarter hours must be at the 400 level, and at least 16 quarter hours must be in one of the five areas of specialization, including 12 quarter hours at the 400 level.

Core Curriculum

Required: 6 courses (24 quarter hours).

The student must participate in and successfully complete the omnibus seminar described above. Registration for at least 12 quarter hours in Urban Planning and Policy 495—Omnibus is required.

Urban Planning and Policy 373—Urban Planning Methods
Urban Planning and Policy 380—Quantitative Skills and Analytical Tools I

Urban Planning and Policy 382—Management and Administrative Skills I

Urban Planning and Policy 384—History and Theory of Urban Planning and Policy

Urban Planning and Policy 390—Policy and Program Evaluation and Experimental Design

Urban Planning and Policy 406—Urban Models and Planning

Either a master's research project or a thesis is required. The student who chooses the project option must register for at least 4 quarter hours in Urban Planning and Policy 497—Master's Project Research, but no more than 12 quarter hours may be counted toward the degree requirements. The student who chooses the thesis option must register for at least 8 quarter hours in Urban Planning and Policy 499—Thesis Research, but no more than 16 quarter hours may be counted toward the degree requirements. With faculty approval, the MUPP omnibus research seminar may be developed into a fulfillment of the thesis/project requirement.

Completion of a one-term professional internship or field experience in urban policy and planning is required. It is recommended that the student register for 12 quarter hours in Urban Planning and Policy 453, but no more than 16 quarter hours may be counted toward the degree requirements. The internship/field experience may be waived for a student with equivalent planning experience. A petition is required.

Doctor of Philosophy in Public Policy Analysis

The urban planning and policy specialization in the PhD in Public Policy Analysis provides advanced professional training in the analysis, evaluation, and implementation of programs and plans in the areas of urban planning and policy, transportation policy, housing policy, health policy, community development, employment policy, urban economic development, and urban design. The focus of the program is upon an advanced level of understanding and familiarity with the multifaceted problems and techniques of applied research

and planned policy-making within the urban environment. The specialization prepares students for public service careers in the development and administration of programs of planned change in urban policy.

Admission

Regular Admission

Applicants are considered on an individual basis. They must have a baccalaureate and a master's degree from an accredited college or university, and a grade point average of at least 4.00 (A=5.00) for the final 90 quarter hours (60 semester hours) of undergraduate study. A statement of professional goals and three letters of recommendation from faculty members or others familiar with the applicant's training, ability, and experience are required. Applicants must also submit scores on the Graduate Record Examination (verbal and quantitative tests). With the permission of the director of graduate studies, applicants may substitute verbal and quantitative aptitude test scores from the Law School Admission Test or other comparable tests. Applicants are encouraged, but not required, to submit scores from the advanced GRE test in such policy-related fields as economics, engineering, geography, history, political science, psychology, or sociology.

In exceptional cases, applicants with undergraduate grade point averages of less than 4.00 but above 3.75 may be admitted if they can show substantial evidence of their ability to complete the program successfully. Such students will be admitted on limited status.

The program accepts the minimum Graduate College requirements regarding the submission of transcripts (p. 29).

Nondegree Admission

A limited number of nondegree students will be admitted each term. Applicants must hold a master's degree and must submit a transcript from the institution that awarded that degree. They must also supply a letter stating why they feel nondegree admission would be beneficial to them. Nondegree students must satisfy all prerequisites for courses may plan to take.

Degree Requirements

A minimum of 144 quarter hours of graduate work beyond the baccalaureate is required. The plan of study for each student is prepared in consultation with and must be approved by the adviser assigned by the director of graduate studies. It must have the following components: core curriculum, quantitative analysis requirement, distribution requirement, area of specialization, professional career training, and dissertation.

Core Curriculum

A common interdisciplinary introduction to a number of theoretical and methodological tools provides a foundation for advanced public policy analysis. Unless they have previously taken equivalent courses, all candidates must take five courses (20 quarter hours) of the public policy analysis core. These courses are:

Methodologies for policy research: Public Policy Analysis 400—Introduction to Public Policy Analysis.

Research design. One course chosen from: Urban Planning and Policy 379—Planning Research Methods and Data Analysis; Urban Planning and Policy 390—Policy and Program Evaluation and Experimental Design; Political Science 404—Research Design for Public Policy.

Quantitative analysis: Urban Planning and Policy 380—Quantitative Skills and Analytical Tools; Urban Planning and Policy 407—Advanced Methods of Urban Policy Analysis.

Economic policy. One course chosen from: Economics 401—Microeconomics I; Economics 403—Nonmarket Decision-Making; Economics 411—Macroeconomics I.

Public policy formulation, implementation, and evaluation: Public Policy Analysis 405—Public Policy: Formulation, Implementation, Evaluation.

Qualifying Examination

Not later than four terms after admission to the program or the completion of 48 quarter hours of work (whichever comes first), each student must take a written qualifying examination testing mastery of and ability to integrate the core curriculum concepts and the quantitative analysis skills. A student who fails on the first attempt may take the examination a second time. A third examination is not permitted. The examination is offered twice during the academic year.

Area of Specialization and Distribution Requirements

At least 44 quarter hours of course work must be undertaken within the urban planning and policy specialization. A minimum of 12 quarter hours of this specialty area study must be with a unit of the University other than urban sciences.

Each student in the specialization will be assigned a faculty adviser on the basis of the student's indication of a substantive area of interest (i.e., urban planning policy, transportation policy, housing policy, health policy, community development, employment policy, urban economic development, or urban design). The student's adviser, in consultation with the director of graduate studies for urban sciences, will develop an individualized plan of study, providing a selection of courses from those available throughout the University that are appropriate to the student's prior course work, academic and professional background, and particular urban planning and policy interest.

Professional Career Training

All candidates are required to participate in one of the two programs described below. Professional career training may not begin until the student has completed at least one year of course work. Not more than 12 quarter hours of credit may be applied to the fulfillment of the degree requirements.

1. Internship Option. The student is assigned to an internship in a public or private agency on a full-time basis for at least one term. This field training leads to an analytical research paper on a policy problem selected before the student is placed, and agreed on by the student's adviser, the director of graduate studies, and the cooperating agency. This option is strongly recommended for students anticipating careers in government and other public or quasipublic institutions.

2. Research Option. The student participates in a research project in collaboration with a faculty member or team of faculty members and students. Projects will focus on an actual problem in public policy analysis, will involve working directly with agencies and organizations related to the problem selected, and will contain a substantial field experience component. The student works as a full research colleague and is involved in all aspects of the project—design, execution, analysis, and report of results. The student will make a formal presentation, oral or otherwise, on the project's findings.

Preliminary Examination

The preliminary examination is normally taken upon

completion of all course work and consists of two parts: A comprehensive written examination covering the student's program of study in the area of specialization and an oral examination covering both the student's program in the area of specialization and the student's dissertation prospectus.

The student will be examined by a five-person committee of whom at least two must be members of the graduate faculty, and one must be from outside of the School of Urban Sciences. The committee shall be appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies for urban sciences.

Dissertation

A dissertation is required and must be defended before a committee appointed by the Dean of the Graduate College on the recommendation of the director of graduate studies. The committee shall have at least five members of whom at least two must be members of the graduate faculty, one must be the candidate's dissertation adviser, and one must be from outside the School of Urban Sciences. The final version of the dissertation will incorporate any changes recommended by the committee. In most cases, a minimum of 36 hours will be required to prepare a dissertation acceptable to the committee.

Courses for Graduate and Advanced Undergraduate Students

300. Issues in Urban Education Policy and Planning. 4 Hours. Same as Education 300. Major areas of conflict—such as race and ethnic relations, school governance, equality of opportunity, teacher bargaining, neighborhood control—that affect education in metropolitan areas. Emphasis on an understanding of the historical background and the current status of the selected issues and their implications for education policy and planning. Prerequisite: Consent of the instructor. Crowson, Spring.

302. Philosophy of Education and Urban School Policy. 4 Hours. Same as Education 302. Systematic exploration of selected educational theories and philosophies; particular emphasis on their impact on the problems of formulating urban educational policy. Areas of special concern: serving pluralistic interests, curriculum design, school organization, and school control. Tesconi, Fall, Winter, Spring..

303. Policy Issues in the History of American Education. 4 Hours. Same as Education 303. Topical analysis of political, economic, and cultural influences shaping the development of American education policy; emphasis on issues of education theory and practice in their historical settings. Warren, Fall, Winter, Spring.

306. The Politics of Urban Education. 4 Hours. Same as Education 306 and Political Science 340. Relations between school governance and urban politics. Particular attention to the role of educational interest groups, the school board, professional educators, citizens, and civic leaders in the formulation and execution of educational policy. Prerequisite: Consent of the instructor. Hurwitz, Spring.

307. Alternative Educational Systems. 4 Hours. Same as Education 307. Selected systems within and outside the public school system. Emphasis on origins, nature, and potential eventualities, including impact on the public schools. Prerequisite: Consent of the instructor. Pulliam, Spring.

338. Majority and Minority Cultural Interaction. 2 to 4 Hours. Same as Social Work 349. Critical examination of the nature and development of status and economic factors likely to be important in accounting for majority and minority cultural interaction. Analysis of various conditions under which competition with minorities may or may not result in discrimination. Implications of this analysis for social work practice and the role of the professional social worker. Staff, Fall, Winter.

340. Urban Transportation Policy. 4 Hours. Introduction to transportation planning and policy; emphasis on the national and regional character of transportation planning, transportation policy goals, and questions of authority, financing, and usage. Prerequisite: Junior standing or consent of the instructor. Pikarsky, Fall.

351. Medical Sociology. 4 Hours. Same as Sociology 351. Sociological contributions to medicine and public health; social organiza-

tion and the organization of health services; the sociology of illness. Prerequisites: 8 hours of upper-division sociology or consent of the instructor. Bucher, Fall.

361. Biometrics in Public Health I. 3 Hours. Same as HB 300 (School of Public Health). Nature, scope, and terminology of biostatistics; appropriate uses and common misuses of health statistics; the application of selected statistical procedures. Theoretical aspects are held to a minimum; applicability of course content is stressed relative to current health problems and programs. Prerequisite: Consent of the instructor.

362. Principles of Epidemiology. 3 Hours. Same as HA 300 (School of Public Health). Introduction to the analysis of the distribution of infectious and noninfectious diseases; the determinants of health and disease in populations; application of the epidemiologic method to disease prevention and control. Prerequisite: Credit or concurrent registration in UPP 361 or the equivalent.

363. Principles of Environmental Quality. 3 Hours. Same as HE 300 (School of Public Health). Environmental problems with emphasis on human health aspects; interactions between man and his resources and environment within the terrestrial system; trends and projections. Environmental insults within the air, water, and land environments. Legal and socioeconomic considerations. Case studies of current environmental controversies. Prerequisite: Consent of the instructor.

365. Contemporary Health Care Services. 3 Hours. Same as HC 300 (School of Public Health). Medical care system: health professions, hospitals, health insurance, government programs, professional organizations, cost and quality control, needs, demand, supply, availability, community health systems, political trends. Prerequisite: Consent of the instructor.

366. Evaluation and Assessment of Health Services. 3 Hours. Same as HC 313 (School of Public Health). Development of methodology, including policy analysis, systems approach, and decision models. The logical basis for health measurement and practical aspects of planning and executing evaluation studies.

368. Economics of Health Care. 3 Hours. Same as HR 325 (School of Public Health). Elementary tools of microeconomics applied to current problems of resource allocation in the production of health services. Characteristics of United States health care sector; consumer demand for medical services; production and supply of health care facilities and personnel; productivity and cost measurement; restrictions on competition; health insurance proposals; cost-benefit analysis; environmental health.

373. Urban Planning Methods. 4 Hours. The planning process and the acquisition and manipulation of related information. Planning information systems and planning model building. Familiarization with statistical package programs. Prerequisite: Consent of the instructor. Foerster, Fall.

379. Planning Research Methods and Data Analysis. 4 Hours. Basic introduction to the data sources and substantive research techniques most commonly used in planning. Issues of decision-making based on limited or imperfect information. Prerequisite: Consent of the instructor. Mier, Winter.

380. Quantitative Skills and Analytical Tools I. 4 Hours. Fundamental mathematical concepts, calculus, matrices, and probability. Research techniques, computer manipulation and storage of data. Estimation, regression, and correlation. Sen, Winter.

381. Quantitative Skills and Analytical Tools II. 4 Hours. Survey of operations research techniques with urban applications. Introduction to a computer language. Urban information systems. Prerequisite: UPP 380.

382. Management and Administrative Skills I. 4 Hours. Provides students with fundamental but sound knowledge and understanding of key administrative and managerial skills essential for urban policy makers and planners, organization behavior, and decision-making in the political environment. Prerequisite: Consent of the instructor. Orlebeke, Fall.

383. Management and Administrative Skills II. 4 Hours. Continues Urban Planning and Policy 382. Relation and integration of operations, systems, and accounting methods to the decision-making process. Prerequisites: UPP 382 and consent of the instructor.

384. History and Theory of Urban Planning and Policy. 4 Hours. Study and analysis of those planning theories, policies, and methods that have evolved in response to the need for physical and human services planning in the urban community. Prerequisite: Consent of

the instructor. Crowson, Mier, Fall.

385. History and Problems of Urban Society I. 4 Hours. The evolution of cities into urban complexes; emphasis on the various city-forming forces. Special attention to the benefits and problems stemming from the process of urbanization. Prerequisite: Consent of the instructor. Staff.

386. History and Problems of Urban Society II. 4 Hours. Continues Urban Planning and Policy 385. Focus on specific as opposed to general topics. Prerequisites: UPP 385 and consent of the instructor. Staff.

387. Community Studies. 4 Hours. Study and analysis of changing models of socialization, the community in the larger context, and principles of community organization. The sociology and anthropology of diverse populations in the city and in the suburbs. Prerequisite: Consent of the instructor. Cartright, Summer.

388. Geographic Information Systems I. 4 Hours. Same as Geography 381. Problems encountered in the gathering and use of geographic data and the structuring of research in relation to existing relevant theory, measurement systems capabilities, and recognized objectives of research activities. Topics include review of data sources, methods of measurement, sampling models, and problems of dealing with aggregated reporting units, records matching, and missing data. Prerequisites: Geog 100, 182 (or Math 117, or Soc 185, or QM 272), one 12-hour introductory geography sequence, and one 8-hour systematic geography sequence; or Geog 385, 386, or 387. Thomas, Fall.

390. Policy and Program Evaluation and Experimental Design. 4 Hours. Methods used to evaluate policies and programs; tools that planners may use in evaluation. The relationships between evaluation and planning. Experimental and quasi-experimental designs and their uses in policy planning and evaluation. Prerequisite: UPP 380. Lyons, Spring.

397. The Dynamics of Planned Change in Public Programs. 4 Hours. The legislation, lobbying forces, public pressures, and administrative and political controls that influence operations of government planning and service agencies. A case-study approach is used. Prerequisite: Consent of the instructor.

399. Independent Study in Urban Planning. 2 to 4 Hours. Reading, study, research, and field work under the supervision of a faculty member. A written report with an annotated bibliography is required. Prerequisite: Approval of the Master of Urban Planning and Policy program director. Staff, Fall, Winter, Spring.

Courses for Graduate Students

401. Regional Public Policy Planning. 4 Hours. The scope of regional planning. Regional economics as it affects planning; economic and population projections and techniques; issues in regional planning related to levels of control, regulation, and jurisdictions. Differences between comprehensive and categorical planning methods. Prerequisite: Concurrent registration in UPP 402.

402. State and Local Planning. 4 Hours. Planning at the state, metropolitan, and local government levels. The scope of state, metropolitan, and local planning, the fragmentation of controls and jurisdictions, and the problems of comprehensive and categorical planning techniques. Relationships among state, local, and regional planning. Prerequisite: Consent of the instructor. Winter.

403. Public Record Keeping and Data Collection. 4 Hours. The functions of public record keeping, efficiency of data collection for internal uses and evaluation purposes, and the uses of public data for accountability to clients. Attention to survey techniques and the integration of survey data and other public information systems. Prerequisite: UPP 373 or consent of the instructor.

405. Urban Models and Planning. 4 Hours. Introduction of quantitative models used in urban planning. Case studies of selected models from the fields of demand models, deployment models, and regional planning models; input-output models and grand scale models. Prerequisite: UPP 373 or consent of the instructor.

406. Urban Models Laboratory. 4 Hours. Laboratory experience with techniques in the construction and operation of models used in urban planning; introduction to major data sources. Prerequisite: UPP 405.

408. Planning Issues in Client-Servicer Relationships. 4 Hours. The theoretical and ethical issues of social intervention. The impact and effects of different definitions of intervention. Emphasis on the role of intervention, the relation of goals to programs, the role of the client

in the program, and the impact of professionalization in service agencies. Prerequisites: UPP 401, 402.

410. Urban Employment Planning and Policy. 4 Hours. The importance of employment and training in planning and policy making. History, theories, and methodologies of human resource development; particular focus on emergent employment training policies. Prerequisite: UPP 405 or consent of the instructor. Mier, Pulliam, Spring.

411. Resource and Expenditure Planning. 4 Hours. Tax and nontax sources of governmental revenue for state and local planning. Legal and equity issues related to the major sources of revenue and categories of expenditure. Overview of forecasting revenues and expenditures, budgeting, the uses of debt, and the handling of municipal bonds. Tax and expenditure reform at the local, state and federal levels. Prerequisite: UPP 373 or consent of the instructor. Lyons, Fall.

412. Social, Economic, and Political Relationships between Public and Private Services. 4 Hours. The linkages between services defined as public and as private. Case studies are used to analyze forms of linkages where public and private services work in concert or at odds with each other. Processes that define certain services as public. Prerequisites: UPP 401, 402.

413. Topics in Advanced Methods of Program Evaluation. 4 Hours. Advanced methodological issues that relate to techniques commonly used in program evaluation. Real and simulated evaluations. Topics include advanced models for causal inference from nonexperimental design, multitrait-multimethod techniques for establishing convergence, and development of indicators and indexes. Prerequisite: UPP 390.

415. Private Investors: Planning and Urban Growth. 4 Hours. The major private sector actors of metropolitan development; their roles, incentives, and impact on new-growth areas, the inner city, older neighborhoods, and the inner-ring suburbs. Past and potential policies relating to the control of these actors. Prerequisite: Consent of the instructor.

419. The Transportation Planning Process. 4 Hours. Urban transportation planning and process, travel demand models, transportation and land use. Examples of transportation planning problems. Prerequisites: UPP 373, 380 or consent of the instructor. Foerster, Winter.

420. Urban Transportation Planning Strategies. 4 Hours. Planning strategies, planning and management technologies, procedures for planning and analyzing travel patterns, questions of network flows. Prerequisite: UPP 419 or consent of the instructor. Foerster, Spring.

421. Urban Transportation Management Strategies. 4 Hours. Management of the public and private components of urban transportation systems. Transit marketing, route design, scheduling and information systems; traffic engineering and control techniques; pricing policy; para-transit planning and regulatory constraints; design of multimodal systems. Prerequisite: UPP 420.

431. Community Organization: Methods and Application. 4 Hours. Political, social, and economic organization of American communities. Emphasis on neighborhood power structure and neighborhood interaction with the broader community. Prerequisite: Consent of the instructor. Cartright, Fall.

432. Community Planning and Development. 4 Hours. Theory and practice of local community development and planning. Analysis of factors that determine how communities develop and the role of planning in that development. Alternative development strategies and how planning can be used to implement them. Prerequisite: Consent of the instructor. Mier, Spring.

433. Principles of Planning. 4 Hours. Introduction to the techniques of physical planning. Basic principles, including concepts in spatial location and arrangement. Elementary visual presentation techniques; studio experience with planning problems. Prerequisite: Consent of the instructor.

434. Community Planning. 2 to 4 Hours. Same as Social Work 453. A range of approaches to community planning; special emphasis on their application to the development and implementation of social welfare programs. Various levels of planning and their relationship to other planning professions. Professional skills included are those pertaining to technical data collection, political processes, grantsmanship, citizen involvement, advocacy roles, and models for evaluation. Prerequisite: UPP 439. Marksman, Fall; H. Brown, Winter.

435. Development and Implementation of Social Planning Policies. 4 Hours. The process of developing programs for social improvement. How social goals become policy and how that policy is implemented. Discussion of process participants and their interaction. Prerequisite: Consent of the instructor.

436. Analysis of Contemporary Social Policy and Planning. 4 Hours. Development of an analytical framework for the examination of social planning activities. Various approaches to social planning and evaluation of the relative utility of each. Prerequisite: Consent of the instructor. Mier, Robins, Spring.

437. Innovation and Change in Social Planning Programs and Organizations. 4 Hours. Seminar on the response of social welfare organizations and programs to changing or newly identified problems, crises, or altered priorities. Selected programs as they have evolved in response to changing attitudes or conditions. A major field work project is required. Prerequisite: Consent of the instructor. Cartright, Spring.

450. Urban Land Use Policy and Practice I. 4 Hours. Historical view of urban land use planning with special emphasis on public land ownership in city development; various techniques of land use control and regulation at the local, state, and federal levels; social implications of land use policy and practice. Prerequisite: Consent of the instructor. Levin, Weaver, Summer.

451. Urban Land Use Policy and Practice II. 4 Hours. Emphasis on public and private interests in land use decision-making; economic and political implications; influence of federal policy and programs on land development; ecological and environmental considerations; innovations in land use control and future policy alternatives. Prerequisite: UPP 450 or consent of the instructor. Babcock, Smith, Fall.

452. Topics in Urban Growth and Development. 4 Hours. May be repeated for up to 12 hours of credit. Factors influencing, negatively or positively, urban growth and development. Smaller urban complexes and vast urban conurbations. Areas for analysis are selected jointly by instructors and students. Examples: economic considerations, government programs and policies, planning concepts, national housing goals. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

453. Graduate Professional Field Experience in Urban Policy and Planning. 0 to 16 Hours. Satisfactory/unsatisfactory grade only. Based on negotiations among the program's faculty, the student, and a receiving agency in either the public or the private sector, the student undertakes a full-time professional field assignment for one term. The nature and intent of the assignment is determined in advance. An appropriate paper based on the experience is required. Prerequisites: At least 24 hours of 400-level work in the Urban Planning and Policy program and consent of the instructor. Cartright, Spring, Summer.

463. The Politics of Health Care. 4 Hours. Four aspects of the political process as they relate to health care services: expression of public interest, electorate demand for government intervention, negotiation of conflict of interests, and passage of bills through congressional committees and Congress. Prerequisite: Consent of the instructor. Robins, Fall.

464. The Geography of Health Care. 4 Hours. Application of spatial and locational concepts and models to existing health facilities and personnel and to planning their future supply. Prerequisite: Consent of the instructor. Robins, Winter.

467. The Health Care System. 3 Hours. Same as HC 410 (School of Public Health). A systems analysis approach to the interrelationships of the six components of health: illness, epidemiology, facilities and manpower, financing utilization, and organization of services. Winter.

468. Theories and Concepts of Health Planning. 4 Hours. Conceptual, analytical, and systems framework to evaluate and plan the organization, distribution, financing, and delivery of health care services in the United States. Prerequisite: UPP 365 or consent of the instructor. Robins, Spring.

469. Health Planning in the United States. 3 Hours. Descriptive and analytical review of major health planning efforts, including the legislation and experimentation of the last decade; emphasis on elements evolving in current national health insurance proposals. Prerequisite: UPP 365 or consent of the instructor. Robins, Fall.

491. Problems in Urban Education. 4 Hours. May be repeated up to a total of 8 hours of credit. Same as Education 491. Intensive field-

oriented study of selected urban educational problems, such as bureaucracy and education, ethnic concern and schools, and educational finance. Emphasis on the collection and analysis of appropriate data. Crowson, Fall, Summer.

492. School Finance and Policy Analysis. 4 Hours. Same as Education 401. Concepts of school finance, taxation, and resource allocation. Role of state, local, and federal governments in the support of education. Fundamentals of program budgeting and systems analysis techniques in educational planning. Prerequisite: Consent of the instructor. Crowson, Winter.

493. Improving Educational Organizations: Planning and Decision-Making. 4 Hours. Same as Education 402. The decision-making process within educational organizations. Different theories of decision-making are analyzed and applied to the formulation of school policy. Prerequisite: Consent of the instructor. Crowson, Fall.

495. Omnibus. 4 to 12 Hours. May be repeated for up to a total of 12 hours of credit. A multidisciplinary research seminar involving team analyses of contemporary urban problems. Under close faculty direction, students cooperatively apply their skills and ideas to an actual planning or related problem. Prerequisites: Master of Urban Planning and Policy candidate and consent of the program director. Staff, Fall, Winter.

497. Master's Project Research. 4 to 12 Hours. May be repeated for credit. Available to all students in the Master of Urban Planning and Policy degree program. Individual study and research. Prerequisites: Degree candidate and consent of a faculty adviser. Staff, Fall, Winter, Spring.

498. Independent Study in Urban Policy and Planning. 4 to 16 Hours. May be repeated for up to a total of 16 hours of credit. Advanced independent study and analysis of approved topics selected and agreed upon by the student and the adviser. A written report prepared under the guidance of the faculty adviser is required. Prerequisite: Consent of the instructor. Staff, Fall, Winter, Spring.

499. Thesis Research. 0 to 16 Hours. May be repeated for credit. Open only to degree candidates. Individual study and research. Prerequisite: Consent of the thesis adviser. Staff, Fall, Winter, Spring.

Additional Courses for Graduate Credit

ARCHEOLOGICAL STUDIES

Courses for Graduate and Advanced Undergraduate Students

301. Technology of Greek and Roman Metals. 4 Hours. Same as Classics 301 and Materials Engineering 350. Nontechnical study of Greek and Roman smelting, casting, fabrication techniques. Metals and the metallurgist in the ancient Mediterranean. Anthropology 150, 245, 255; Classics 110, 279; and History 201-204 are recommended.

302. Techniques of Greek and Roman Buildings. 4 Hours. Same as Architecture 361, Classics 302, and Materials Engineering 351. Reconstruction and analysis of ancient buildings from the Aegean Bronze Age to the Roman Empire. Description and demonstration of ancient structural principles. Anthropology 150, 245, 255; Classics 110, 279; History 201-204; and History of Architecture and Art 231 are recommended.

303. Ceramics for the Archeologist. 4 Hours. Same as Anthropology 303, Art-Design 340, and Classics 303. Description and interpretation of pottery and other ceramic materials found in archeological contexts. Manufacture of handmade and thrown pottery. Anthropology 150, 245, 255; Classics 110, 279; and History 201-204 are recommended.

ASIAN STUDIES

Courses for Graduate and Advanced Undergraduate Students

301. Topics in East Asian History. 4 Hours. May be repeated for

credit. Same as History 371. Specific topics are announced each term. Prerequisite: 4 hours of East Asian history.

314. Far Eastern Ceramics. 4 Hours. Same as History of Architecture and Art 370. History and appreciation of the major art form of China, Korea, Japan, and South Asia; pottery, stoneware, and porcelain. Prerequisites: 8 hours of Asian studies and 12 hours of history of architecture and art at the 200 level.

315. Chinese Landscape Painting. 4 Hours. Same as History of Architecture and Art 371. History from the origins to the twentieth century, major trends and figures. Prerequisite: AsSt 215 or 12 hours of Asian studies.

316. Japanese Prints. 4 Hours. Same as History of Architecture and Art 372. History from the fourteenth century to the present; emphasis on Ukiyoe Hanga of the fourteenth to nineteenth centuries. Prerequisite: AsSt 216 or the equivalent.

325. Chinese Philosophy. 4 Hours. Same as Philosophy 303. Development of major philosophies. Prerequisite: Two courses in philosophy or junior standing and AsSt 171, 172, 173.

326. Modern Chinese Philosophy. 4 Hours. Same as Philosophy 315. Development of recent Chinese systems of philosophy. Prerequisite: AsSt 325.

336. Problems in South Asian Ethnology. 4 Hours. Same as Anthropology 366. Theoretical and substantive problems in South Asian social organization; special emphasis on systems of social stratification, kinship and family structure, religion, economy, and political processes in the context of social change. Prerequisites: Junior standing, Anth 213, and AsSt 232.

369. Problems in Southeast Asian Ethnology. 4 Hours. Same as Anthropology 369. Survey of selected indigenous and minority populations of mainland and insular Southeast Asia; emphasis on culture change and processes of integration. Prerequisite: AsSt 234.

BLACK STUDIES

Courses for Graduate and Advanced Undergraduate Students

320. Black Theater in America I. 4 Hours. Same as Communication and Theater 320. Development and contribution of Black playwrights, actors, and directors in American theater, 1800-1940. Socio-economic, psychological, and political ideas in the works of both Black and white playwrights, together with the image of the Black artist and character in American plays. Prerequisite: ComTh 209 or BISt 171 or consent of the instructor.

321. Black Theater in America II. 4 Hours. Same as Communication and Theater 321. Development and contribution of Black playwrights, actors, and directors in American theater, 1940 to present. Prerequisite: ComTh 209 or BISt 171 or consent of the instructor.

341. Topics in African History. 4 Hours. Same as History 341. Study in depth of specific problems of internal African history, with concentration on such topics as the African role in the slave trade, the growth and decline of African states, African syntheses with European culture, or the African reaction to European domination and conquest. Prerequisite: 4 hours of African history.

349. African History Seminar Abroad. 8 to 16 Hours. Same as History 349. Lectures, seminars, and independent study in Africa for one term. Prerequisites: 8 hours of African history and consent of the instructor.

370. Topics in Black Culture. 4 Hours. May be repeated for a maximum of 12 hours, 4 of which are required for the major. Seminar on various topics. Specific topics are announced each term. Prerequisite: BISt 171.

CLASSICS

Courses for Graduate and Advanced Undergraduate Students

301. Technology of Greek and Roman Metals. 4 Hours. Same as Archeological Studies 301 and Materials Engineering 350. Nontechnical study of Greek and Roman smelting, casting, fabrication

techniques. Metals and the metallurgist in the ancient Mediterranean. Anthropology 150, 245, 255; Classics 110, 279; and History 201-204 are recommended.

302. Techniques of Greek and Roman Buildings. 4 Hours. Same as Archeological Studies 302, Architecture 361, and Materials Engineering 351. Reconstruction and analysis of ancient buildings from the Aegean Bronze Age to the Roman Empire. Description and demonstration of ancient structural principles. Anthropology 150, 245, 255; Classics 110, 279; History 201-204; and History of Architecture and Art 231 are recommended.

303. Ceramics for the Archeologist. 4 Hours. Same as Anthropology 303 and Archeological Studies 303. Description and interpretation of pottery and other ceramic materials found in archeological contexts. Manufacture of handmade and thrown pottery. Anthropology 150, 245, 255; Classics 110, 279; and History 201-204 are recommended.

348. Mythology in Rome. 4 Hours. Same as Religious Studies 300. The conscious assimilation and adaptation of Greek mythology in Rome; investigation of the concept of mythology. Prerequisite: Cl 248.

349. Classical Rhetorical Tradition. 4 Hours. Development from the beginnings in ancient Greece to the Renaissance. Major emphasis on the rhetorical works of Plato, Aristotle, Cicero, and Quintilian. Prerequisites: Junior standing and consent of the instructor.

350. Aeschylus and Sophocles. 4 Hours. Knowledge of Greek is not required. Close reading of all of the plays of Aeschylus and Sophocles in translation; discussion of literary, moral, religious, political, and mythical issues and ideas. Prerequisite: Cl 249.

351. Euripides. 4 Hours. Knowledge of Greek is not required. Close study of the works of Euripides, the environment in which they were created, and their influence on later European drama. Prerequisite: Cl 249.

370. Plato: Dialogues. 4 Hours. The middle and late *Dialogues* and their fourth-century context.

393. Translation: Theory and Practice. 4 Hours. A reading knowledge of Greek or Latin is expected. Introduction to classical and post-Renaissance concepts of fidelity and creativity; a practicum devoted to authors previously emphasized in the student's curriculum. Prerequisite: Consent of the instructor.

398. Topics in Classical Civilization. 4 Hours. Knowledge of Greek or Latin is not required. Significant themes and topics in classical literature and society. Topics vary. Prerequisite: Two courses in classics at the 200 level, excluding Cl 201.

GREEK

Courses for Graduate and Advanced Undergraduate Students

305. Homer: Iliad. 4 Hours. Reading and translation of extensive selections from the poem. Introduction to Homeric scholarship. Prerequisite: 8 hours of classical Greek at the 200 level or the equivalent.

310. Pindar. 4 Hours. Reading and analysis of selected *Odes*. Prerequisite: 8 hours of classical Greek at the 200 level or the equivalent.

315. Aeschylus: Agamemnon. 4 Hours. Reading and analysis of the play; discussion of the use of myth. Prerequisite: 8 hours of classical Greek at the 200 level or the equivalent.

329. Greek Science. 4 Hours. Individual conferences on assigned papers are required. Primarily for Greek majors. Examination and interpretation of selected texts illustrative of the classical development of Greek science from 500 BC. Prerequisite: Any 200-level course in Greek.

330. Aristophanes. 4 Hours. Reading and translation of at least two plays. Prerequisite: 8 hours of classical Greek at the 200 level or the equivalent.

365. Aristotle: Nicomachean Ethics. 4 Hours. Same as Religious Studies 365. Reading and analysis of selections from several books. Sources and problems of Aristotle's ethical writings. Prerequisite: 8 hours of classical Greek at the 200 level or the equivalent.

370. Thucydides. 4 Hours. Reading and translation of selections from Thucydides' history of the Peloponnesian War. Sources and

problems of Greek historiography. Prerequisite: 8 hours of classical Greek at the 200 level or the equivalent.

HISTORY OF ARCHITECTURE AND ART

Courses for Graduate and Advanced Undergraduate Students

302. Seminar on Primitive Art. 4 Hours. Selected topics in the visual arts of Africa, Oceania, and indigenous peoples of America. The role of politics, colonialism, religion, and the artists and artistic personality. Prerequisite: Any one of HAA 202, 203, or 238 or consent of the instructor.

320. The Medieval City. 4 Hours. Forms of city plans and urban architecture and their relationship to surrounding cultural and institutional factors. Prerequisite: Arch 242 or 4 hours of history of architecture and art in the medieval area.

323. Gothic Sculpture. 4 Hours. Development of sculpture in northern Europe from 1140 to 1530. Prerequisites: Junior standing and 4 hours of history of architecture and art at the 200 level.

325. Seminar on Medieval Art. 4 Hours. Individual conferences on assigned papers are required. Selected problems in the history of medieval art. Series of lectures followed by student reports. Prerequisites: Junior standing and 4 hours of history of architecture and art at the 200 level.

331. Seminar on the History of Architecture. 4 Hours. Selected problems. Prior to registration the student should be advised by the instructor. Prerequisite: 12 hours from HAA 231 through 238.

332. Readings in the History of Architecture. 4 Hours. May be repeated for credit three times. Individually planned readings on selected topics under the supervision of a faculty member. Prerequisites: 12 hours from HAA 231 through 238 and approval of the instructor and the department.

333. Literature, Theory, and Criticism. 4 Hours. Selected readings and discussion of significant writers on architecture. Prerequisites: 12 hours from HAA 231 through 238 and approval of the instructor and the department.

334. Chicago Building. 4 Hours. Architectural and technical history of Chicago's commercial buildings from 1871 to the present. Prerequisite: 12 hours from HAA 231 through 238.

340. The Renaissance and Baroque City. 4 Hours. Forms of city plans and urban architecture in relationship to cultural and institutional characteristics. Prerequisite: Arch 382 or 4 hours of the history of architecture and art Renaissance and baroque sequence.

341. Art of the Fifteenth Century in Florence. 4 Hours. Stylistic and iconographic studies of the works of the major painters, sculptors, and architects. Florentine history and literature in their relation to the visual arts. Prerequisites: Junior standing and 4 hours of history of architecture and art at the 200 level.

343. Italian Art from 1520 to 1600. 4 Hours. Art of the sixteenth century; emphasis on painting and sculpture. Special attention to Correggio, Pontormo, Bronzino, Gianbologna, Michelangelo, Palladio, Titian, and Tintoretto. Prerequisites: Junior standing and 4 hours of history of architecture and art at the 200 level.

361. Proseminar on Modern Painting. 4 Hours. May be repeated for credit at the discretion of the department. Selected examples; development and diffusion of style and iconography. Analogies in the history of ideas and events, technical change, and other pertinent material. Prerequisites: Junior standing and 4 hours of history of architecture and art at the 200 level.

363. Contemporary Art. 4 Hours. The most recent developments in contemporary art, its theories and production. Prerequisites: Junior standing and 4 hours of architecture and art at the 200 level.

370. Far Eastern Ceramics. 4 Hours. Same as Asian Studies 314. History and appreciation of the major art form of China, Korea, Japan, and South Asia; pottery, stoneware, and porcelain. Prerequisites: 8 hours of Asian studies and 12 hours of history of architecture and art at the 200 level.

372. Japanese Prints. 4 Hours. Same as Asian Studies 316. History from the fourteenth century to the present; emphasis on Ukiyoe Hanga of the seventeenth to nineteenth centuries. Prerequisite: HAA 272 or the equivalent.

381. Seminar on American Art. 4 Hours. Individual conferences on assigned papers are required. American artists or movements selected with the permission of the instructor. Prerequisites: Junior standing and 12 hours of history of architecture and art at the 200 level.

385. Seminar: Film Issues. 4 Hours. Individual conferences on assigned papers are required. Studies in genres, schools, individual artists, critics, and theorists of the motion picture. Subject areas are specified by the instructor. Prerequisites: Junior standing and HAA 285, 286.

391. Special Studies in the History of Art. 4 Hours. May be repeated for a maximum of 12 hours. Discussions each term of special problems, with attention to a major theme, period, or artist. Student reports are required. Prerequisites: Senior standing, 12 hours of history of architecture and art at the 200 and 300 levels, and approval of the instructor and the department.

392. Readings in Art History. 4 Hours. May be for credit at the discretion of the department. Individually planned readings on selected topics under the supervision of a faculty member. Prerequisites: Senior standing, 12 hours of history of architecture and art beyond the 100 level, and approval of the instructor and the department.

393. History of Collecting and Museology. 4 Hours. Individual conferences on assigned papers are required. The history of collecting and patronage. The scope and operation of public and private collections and museums. Lectures, discussions, and field trips. Prerequisites: Junior standing and HAA 142, 143, 144.

394. Introduction to Historic Preservation. 4 Hours. Preservation planning, historic building restoration, and the political and economic factors affecting the conservation of historic resources. Lectures, discussions, field trips. Prerequisite: 12 hours in the history of art at the 200 level or consent of the instructor.

HUMANITIES

Courses for Graduate and Advanced Undergraduate Students

370. Studies in Racial and Ethnic Dimensions of American Literature. 4 Hours. Same as English 370. May be repeated for a maximum of 12 hours of credit. Content varies. Prerequisite: Senior standing or 12 hours of English.

372. Studies in Native American Literature. 4 Hours. May be repeated for a maximum of 8 hours of credit. Same as English 372 and Native American Studies 372. The history and development of literature by and about Native Americans. Content varies. Prerequisites: Senior standing and 12 hours of English or Native American studies.

ITALIAN

Courses for Graduate and Advanced Undergraduate Students

305. Italian Literary Movements to 1450. 4 Hours. Major developments. Prerequisite: Two 200-level courses in Italian.

306. Italian Literary Movements from 1450 to 1600. 4 Hours. Continues Italian 305. Prerequisite: Two 200-level courses in Italian.

307. Italian Literature from 1600 to 1800. 4 Hours. Continues Italian 306. Prerequisite: Two 200-level courses in Italian.

308. Italian Poetry of the Nineteenth Century. 4 Hours. Study of modes such as neoclassicism, Romanticism, and Decadentism; focus upon Foscolo, Leopardi, Manzoni, Carducci, Pascoli, D'Annunzio. Prerequisite: Ital 106 or consent of the instructor.

309. Italian Prose of the Nineteenth Century. 4 Hours. Background, influences, and polemic of Romanticism and Verismo within the novel; emphasis on the works of Manzoni and Verga. Prerequisite: Ital 106 or consent of the instructor.

320. Dante Alighieri I. 4 Hours. Intensive study of his major works, excluding *Divine Comedy*. Prerequisite: Ital 305.

321. Dante Alighieri II. 4 Hours. *Divine Comedy*. May be repeated for each of the three divisions of *Inferno*, *Purgatorio*, and *Paradiso* for a total of 12 hours of credit. Prerequisite: Ital 320.

322. Topics in Italian Literature of the Middle Ages. 4 Hours. May be repeated for up to 8 hours of credit. The origins of the Italian language as seen through early Italian texts, genres, selected authors or works, periods, and civilization to 1450. Topics vary from term to term. Prerequisite: Ital 305 or consent of the instructor.

323. Topics in Italian Literature of the Renaissance. 4 Hours. May be repeated for up to 8 hours of credit. Genres, selected authors or works, and periods in Italian civilization. Topics vary from term to term. Prerequisite: Ital 306 or consent of the instructor.

324. Topics in Italian Literature of the Seventeenth and Eighteenth Centuries. 4 Hours. May be repeated for up to 8 hours of credit, a topic must not be duplicated. Genres, selected authors or works, and periods in Italian civilization. Topics vary from term to term. Prerequisite: Ital 307 or consent of the instructor.

325. Topics in Italian Literature of the Nineteenth and Twentieth Centuries. 4 Hours. May be repeated for up to 8 hours of credit. Genres, selected authors or works, and periods in Italian civilization. Topics vary from term to term. Prerequisites: Ital 307, 308 or consent of the instructor.

340. History of the Italian Language. 4 Hours. General survey of the development of the Italian language. Prerequisites: Ital 213 and 222 or the equivalents.

349. Phonetics. 4 Hours. Prerequisite: Any 200-level literature course.

373. Topics in Romance Linguistics. 4 Hours. May be repeated for a maximum of 8 credit hours. Same as Spanish 373. Topics vary. Prerequisites: Span 216, 254 or Ital 349, or consent of the instructor.

399. Independent Study. I to 6 Hours. May be repeated for credit. For seniors and graduate students. Independent research on various aspects of Italian culture and studies that are not covered in regular courses. Prerequisite: Consent of the instructor.

JUDAIC STUDIES

Courses for Graduate and Advanced Undergraduate Students

350. Biblical Exegesis. 4 Hours. Analysis of the methods, terminology, and basic assumptions of Bible exegetes from earliest times to the present. Selected Bible texts with commentaries of Rashi, Rashbam, Radak, and other traditional and modern commentators. Prerequisites: Junior standing, 15 hours of Judaic studies, and Heb 106 or the equivalent.

352. Jewish Philosophy: History and Issues. 4 Hours. Examination and analysis of the philosophies of certain key figures in the history of Jewish philosophy—ancient, medieval, and modern—who also exemplify, within a peculiarly Jewish framework, a given philosophical school on persuasion endemic to the history of western philosophy. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

353. Trends in Modern Jewish Thought. 4 Hours. Analysis and critique of a variety of modern philosophies of Judaism and their relationship to parallel contemporary trends in western philosophy. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

355. Contemporary Hebrew Drama. 4 Hours. Analysis of the works of selected contemporary dramatists, their styles and milieus: Aloni, Shamir, Goldberg, Berkovitch, Kishon, Mosenson, Bar-Yosef. Prerequisites: Junior standing, 15 hours of Judaic studies at the 200 level, and Heb 106 or the equivalent.

370. Jewish Education in the United States: History and Issues. 4 Hours. A research-oriented course tracing significant developments in American Jewish schools: organization, philosophy, goals, content, and methods of instruction. Analysis of current issues in Jewish education. Prerequisite: Senior standing, 30 hours of Judaic studies at the 200 level, and Heb 106 or the equivalent.

371. American Jewry: Communal and Cultural Structures. 4 Hours. Research-oriented study of the origins of movements and institutions of the Jewish people in the New World from Colonial times to the present; specific characteristics of the Jewish contribution to American life; denominational diversity of the American Jewish community. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

LATIN AMERICAN STUDIES

Courses for Graduate and Advanced Undergraduate Students

- 315. Advanced Topics in Brazilian Literature. 4 Hours.** May be repeated for credit. Same as Portuguese 315. Topics related to various aspects of Brazilian literary history and Brazilian writers. Topics vary from term to term. Prerequisite: Port 215.
- 342. The Ecology of Colonialism in the Americas. 4 Hours.** Same as Anthropology 342. The variables that conditioned different patterns of colonization and factors in the evolution of intercultural relations through the post-Columbian period in the Americas. Prerequisites: Junior standing and anthropology or Latin American studies major.
- 354. Problems in Mesoamerican Ethnology. 4 Hours.** Same as Anthropology 361. Intensive investigation of selected problems from the Mesoamerican area; special emphasis on religion, economics, and social organization. Prerequisite: LAsT 254.
- 361. Topics in Latin American History. 4 Hours.** May be repeated for credit. Same as History 361. Specific topics are announced each term. Prerequisite: 4 hours of history.
- 362. Topics in Caribbean History. 4 Hours.** Same as History 362. Specific topics having either a national or trans-Caribbean thematic focus are announced each term. Prerequisite: LAsT 285 or 286.
- 363. Topics in Mexican History and the History of the Mexican People in the United States. 4 Hours.** Same as History 363. In-depth study of such topics as Chicano labor history, Chicano oral history, peasants in the Mexican Revolution, and relations between Mexico and the United States within the framework of dependency. A specific topic is announced each term. Reading knowledge of Spanish may be helpful but is not essential. Prerequisite: 8 hours of 200-level Latin American or Chicano history.
- 364. Topics in Brazilian History. 4 Hours.** May be repeated for credit. Same as History 364. Specific topics are announced each term. Prerequisite: 4 hours of history.
- 367. Problems in South American Ethnology. 4 Hours.** Same as Anthropology 367. Intensive reading and research on theoretical and ethnographic problems in South American Indian social structures and cultures. Special attention to the influence of Levi-Strauss's ideas on the formulation of cultural theory in South America. Prerequisite: Graduate standing or Anth 213 and LAsT 255.
- 381. Seminar: Political Problems of Developing Societies. 4 Hours.** May be repeated to a maximum of 12 hours if the subject matter is different for each registration. Same as Political Science 381. Selected aspects of the politics of the countries of Asia, Africa, and Latin America. Prerequisites: PolS 100, 200, 232. Additional prerequisites may be stipulated depending on the subject matter of the seminar.
- 390. Topics in Luso-Brazilian Literature. 4 Hours.** May be repeated for credit. Same as Portuguese 390. Topics related to various aspects of the Luso-Brazilian language, literature, and culture. Topics vary from term to term. Prerequisite: Consent of the instructor.
- 391. Interdisciplinary Seminar on Latin American Studies I. 4 Hours.** Specific topics are announced each term. Prerequisite: Latin American studies major.
- 392. Interdisciplinary Seminar on Latin American Studies II. 4 Hours.** Specific topics are announced each term. Prerequisites: Latin American studies major and LAsT 391.
- 393. Interdisciplinary Seminar on Latin American Studies III. 4 Hours.** Specific topics are announced each term. Prerequisites: Latin American studies major and LAsT 392.
- 394. Topics in Puerto Rican Studies. 4 Hours.** May be repeated for a maximum of 8 hours of credit. In-depth study of selected topics, such as the social history of the family, the process of state formation, education, revivalist movements, gangs, charismatic leadership, and populist politics. Specific topics are announced each term. Prerequisite: Junior standing, 4 hours of Puerto Rican history or consent of the instructor.
- 395. Topics in Latino Community Studies. 4 Hours.** May be repeated for a maximum of 8 hours of credit. In-depth study of a current Latino community issue from an interdisciplinary perspective; emphasis on the learning and use of investigative methodologies. Issues include health, welfare, drugs, undocumented worker, and education. Prerequisites: Junior standing and LAsT 234 or consent of the instructor.

372. Contemporary World Jewry. 4 Hours. Description of the Jewish people the world over; linguistic, cultural, and religious characteristics against the backdrop of political conditions prevalent in the countries of Jewish settlements. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

373. American Jewry: Beliefs, Practices, and Institutions. 4 Hours. Origins of contemporary secular and religious ideologies. American Jewish institutions: family, social, philanthropic, educational; protective organizations and fraternal orders. Socioeconomic status of American Jewry; cultural life and the creative arts. The new ethnicism. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

374. The State of Israel: A Half-Century of Cultural Growth. 4 Hours. Description and discussion of the literary, scholarly, and scientific accomplishments of Israel's Jewish community from 1920 to the present against the backdrop of the tensions of a nascent composite society and the revival of Hebrew as a spoken language. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

375. Israeli Social, Educational, and Political Institutions (1948 to 1974). 4 Hours. A description- and research-based analysis of Israel's multireligious school system and social institutions against the backdrop of the developing democratic regime of the Jewish state. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

376. Topics in Jewish Law and Lore: Shulhan Aruk. 4 Hours. The laws and customs relating to Hanukkah, Purim, and Passover as they have evolved up to modern times through study and analysis of sources in Hebrew literature. Prerequisites: Junior standing, 15 hours of Judaic studies, and Heb 106 or the equivalent.

377. Topics in Jewish Law and Lore: Midrashic and Aggadic Texts. 4 Hours. In-depth study of the principal pedagogical materials created during the Rabbinic period: Midrash Halakah and Midrash Aggadah. The place of Midrash in the history of Judaeo-Christian literature conceptual and literary analysis of representative texts with emphasis on educational goals and methods. Prerequisites: Junior standing and 15 hours of Judaic studies at the 200 level.

LATIN

Courses for Graduate and Advanced Undergraduate Students

- 302. Tibullus and Propertius. 4 Hours.** Reading and interpretation of selections from their chief elegiac poems. Prerequisite: 4 hours of Latin at the 200 level or the equivalent.
- 305. Seneca: Tragedies. 4 Hours.** Reading and interpretation of one or more of the tragedies. Prerequisite: 4 hours of Latin at the 200 level or the equivalent.
- 309. Vergil: Eclogues and Georgics. 4 Hours.** Reading and analysis of selections from Vergil's earlier works. Prerequisite: 8 hours of Latin at the 200 level.
- 310. Plautus II. 4 Hours.** Advanced studies in Roman comedy and the reading of two or more plays not read in Latin 210. Prerequisite: At least 8 hours of Latin at the 200 level or the equivalent.
- 340. Lucretius. 4 Hours.** Reading and interpretation of extensive selections from *De Rerum Natura*. Prerequisite: 4 hours of Latin at the 200 level or the equivalent.
- 348. St. Augustine: The Confessions. 4 Hours.** Same as Religious Studies 348. The autobiographical portions of *The Confessions*. Prerequisite: One 200-level course in Latin.
- 362. Juvenal: Saturae. 4 Hours.** Selections from the sixteen extant satires. Prerequisite: 8 hours of Latin at the 200 level or the equivalent.
- 370. Tacitus: Annals and Histories. 4 Hours.** Intensive study of the early empire and the historiography of Tacitus; extensive reading in the works. Prerequisite: At least 8 hours of Latin at the 200 level or the equivalent.
- 390. The Teaching of Latin in the Secondary School. 4 Hours.** Theory and practice in foreign language instruction in Latin at the secondary level; objectives of instruction in Latin historical perspectives, texts, and materials of instruction; preprofessional orientation. Prerequisite: At least 8 hours of Latin at the 300 level or approval of the department.

LITHUANIAN

Courses for Graduate and Advanced Undergraduate Students

331. History of the Lithuanian Language. 4 Hours. Development of Lithuanian from its Indo-European origins to the formation of the standard language; the conservative aspects of Lithuanian and its relation to Slavic. Prerequisite: 24 hours of Lithuanian or the equivalent or Ling 305.

332. Structure of Lithuanian. 4 Hours. Synchronic analysis of the structure of standard Lithuanian; reference to its historical development. Prerequisite: 24 hours of Lithuanian or the equivalent or Ling 305.

MUSIC

Courses for Graduate and Advanced Undergraduate Students

300. Eighteenth-Century Counterpoint. 3 Hours. Middle to late Baroque music. Analysis of representative scores and written assignments in eighteenth-century contrapuntal style. Prerequisites: Mus 203 and 206 or approval of the department.

301. Sixteenth-Century Counterpoint. 3 Hours. Late Renaissance music. Analysis of representative scores and written assignments in sixteenth-century contrapuntal style. Prerequisite: Mus 300 or approval of the department.

302. Form and Analysis. 3 Hours. The melodic, rhythmic, harmonic, and structural analytic procedures of traditional musical form. Analysis of representative scores from the eighteenth to the twentieth centuries. Prerequisite: Mus 300.

303. Composition I. 4 Hours. Class and individual instruction in the basic techniques of twentieth-century composition. Practice in the use of twentieth-century musical materials. Prerequisites: Mus 203, 206.

304. Composition II. 4 Hours. Continues instruction in the basic techniques of twentieth-century composition. Prerequisite: Mus 303.

305. Composition III. 4 Hours. Continues Music 304. Introduction to basic techniques of electronic music. Prerequisite: Mus 304.

310. Conducting I. 2 Hours. The basic techniques. The use of the baton; beat patterns; division of beats; starting and stopping; the left hand; dynamics; fermatas. Conducting in class. Prerequisites: Mus 203, 206.

311. Conducting II. 2 Hours. Continued study of the basic techniques; solos and recitatives; metric relationships. Elementary study of the score as to form and harmonic content. Development of conducting techniques through use of records and actual conducting of band or choral ensembles. Prerequisite: Mus 310.

315. Orchestration and Arranging I. 3 Hours. The acoustical properties, musical characteristics, and scoring problems of brass, woodwind, and string instruments. Scoring for brass, woodwind, or string ensembles. Prerequisites: Mus 203, 206.

316. Orchestration and Arranging II. 3 Hours. The acoustical properties, musical characteristics, and scoring problems of percussion, keyboard, and electronic instruments. Scoring for mixed ensembles, bands, orchestras, jazz ensembles, and contemporary groups. Prerequisite: Mus 315.

320. Proseminar on Music. 2 to 4 Hours. May be repeated for credit for a maximum of 12 hours. Selected topics for intensive study in specialized areas of musicology or music theory. Prerequisite: Senior standing as a music major.

330. Music as Experience. 4 Hours. The musical experience as found in the writings of theorists, composers, musicians, historians, critics, and philosophers. Prerequisites: Junior standing, Mus 130, and one 200-level course in music.

331. Twentieth-Century Music I. 3 Hours. Historical survey and intensive analysis of major works in early twentieth-century music; emphasis on new harmonic and rhythmic resources. Prerequisites: Mus 203, 206, 232.

332. Twentieth-Century Music II. 3 Hours. Historical survey and intensive analysis of major works in middle and late twentieth-century music; emphasis on new harmonic and rhythmic resources. Prerequisite: Mus 331.

335. Baroque Music. 4 Hours. Representative scores from the Baroque period. Assigned readings. Prerequisites: Mus 203, 232 or the equivalents.

NATIVE AMERICAN STUDIES

Courses for Graduate and Advanced Undergraduate Students

320. Studies in Urban Native Americans. 4 Hours. May be repeated for a maximum of 12 hours. Same as Political Science 320. Native American life in the city: involvement, problems, and responses; organizations; government structures and agencies. Specific topics announced each term. Prerequisite: Junior standing or NAST 221.

364. Problems in North American Ethnology. 4 Hours. Same as Anthropology 364. Intensive reading and research on special problems of religious, economic, and social systems of New World native peoples. Prerequisite: NAST 264.

371. Studies in the Oral Tradition of Native Americans. 4 Hours. Same as English 371, Philosophy 371, and Religious Studies 371. Content, cultural context, and functions of oral traditions. Styles and performances. Specific topics are announced each term. Prerequisite: Junior standing or NAST 275.

372. Studies in Native American Literature. 4 Hours. May be repeated for a maximum of 8 hours of credit. Same as English 372 and Humanities 372. The history and development of literature by and about Native Americans. Content varies. Prerequisites: Senior standing and 12 hours of English or Native American studies.

373. Studies in Native American Education. 4 Hours. May be repeated for a maximum of 12 hours. Same as Education 373. Educational policy, learning styles, language, and practice. Specific topics are announced each term. Prerequisite: NAST 200.

397. Topics in Native American Studies. 4 Hours. May be repeated for a maximum of 12 hours of credit. Specific topics are announced each term. Prerequisites: Junior standing and 20 hours of courses appropriate to the topic.

398. Field Research in Native American Studies. 4 Hours. May be repeated for a maximum of 12 hours of credit. Supervised participation in field research; techniques and procedures are discussed and practiced at an off-campus location. Prerequisites: Senior standing and 12 hours of Native American studies.

399. Independent Study in Native American Studies. 2 to 4 Hours. May be repeated for a maximum of 12 hours of credit. Independent study under the supervision of a staff member. Prerequisites: Senior standing and approval of the department.

PORTUGUESE

Courses for Graduate and Advanced Undergraduate Students

314. Advanced Topics in Brazilian Literature. 4 Hours. May be repeated for credit. Same as Latin American Studies 315. Topics related to various aspects of Brazilian literary history and Brazilian writers. Topics vary from term to term. Prerequisite: Port 215.

390. Topics in Luso-Brazilian Literature. 4 Hours. May be repeated for credit. Same as Latin American Studies 390. Topics related to various aspects of Luso-Brazilian language, literature, and culture. Topics vary from term to term. Prerequisite: Consent of the instructor.

399. Independent Study. 1 to 6 Hours. May be repeated for credit. For graduate students who wish to do independent research on various aspects of Luso-Brazilian studies. Prerequisite: Consent of the instructor.

RELIGIOUS STUDIES

Courses for Graduate and Advanced Undergraduate Students

300. Mythology in Rome. 4 Hours. Same as Classics 348. The conscious assimilation and adaptation of Greek mythology in Rome; investigation of the concept of mythology. Prerequisite: Cl 248.

304. Seventeenth-Century Rationalism. 4 Hours. May be repeated for a maximum of 8 hours of credit with the approval of the department. Same as Philosophy 304. Careful readings of the works of one or more of the rationalist philosophers, such as Descartes, Spinoza, and Leibniz. Prerequisite: Phil 203 or consent of the instructor.

312. Geography of Religions. 4 Hours. Same as Geography 312. Systematic treatment of geographical manifestations of the major religious systems of the world. Special attention to the geographical origins and dispersal mechanisms of religious systems and to the manner in which man organizes his life within the framework of his belief. Intensive study of applications being made in the geographical inquiry of religious systems. Prerequisites: Geog 100, 210.

315. Comparative Religious Movements. 4 Hours. Same as Anthropology 315. Analysis of religious behavior; special reference to the emergence of messianic cults in Africa and Melanesia and among North American Indians and New World Negroes. Prerequisites: Junior standing, 8 hours of either social anthropology or sociology, and consent of the instructor.

332. Topics in Ethics and Value Theory. 4 Hours. Same as Philosophy 332. Intensive treatment of one or more topics, such as the analysis of moral judgments, the classification of ethical theories according to their formal properties, the thesis of ethical relativism, and the comparison between ethical and scientific theories. Prerequisite: Two courses in philosophy or consent of the instructor. Philosophy 216 or 218 is recommended.

348. St. Augustine: The Confessions. 4 Hours. Same as Latin 348. The autobiographical portions of *The Confessions*. Prerequisite: One 200-level course in Latin.

350. Milton. 4 Hours. Same as English 315. A survey of Milton's poetry and prose, with emphasis on his major works. Prerequisite: Senior standing or 12 hours of English.

365. Aristotle: Nicomachean Ethics. 4 Hours. Same as Greek 365. Reading and analysis of selections from several books. Sources and problems of Aristotle's ethical writings. Prerequisite: 8 hours of classical Greek at the 200 level or the equivalent.

371. Studies in the Oral Tradition of Native Americans. 4 Hours. Same as English 371, Native American Studies 371, and Philosophy 371. Content, cultural context, and functions of oral traditions. Styles and performances. Specific topics are announced each term. Prerequisite: Junior standing or RelS 275.

395. Topics in Religious History. 4 Hours. May be repeated for credit. Same as History 395. Specific topics are announced each term. Prerequisite: 4 hours of history.

398. The Problem of Justice. 4 Hours. Same as Criminal Justice 398 and Political Science 398. The premodern view of justice, such as Plato's or Aristotle's; the modern understanding of justice, such as Hobbes's or Locke's, which is the foundation of the modern political regime; Rousseau's seminal political thought on justice, which is the basis for a variety of reforms and alternatives offered to Hobbes's and/or Locke's political regime. Prerequisite: Two courses in political science, including PolS 101 or 151.

WOMEN'S STUDIES

Courses for Graduate and Advanced Undergraduate Students

384. Topics in the History of Women. 4 Hours. May be repeated for credit. Same as History 384. Specific topics are announced each term. Prerequisite: 4 hours of history.

385. Women and Politics: Problems in Policy Analysis and Political Theory. 4 Hours. Same as Political Science 385. The political, social, and economic participation of women in American society. Theories on the use of power, socialization, and psychobiology as models in analyzing the outputs and outcomes of policies that affect women. Prerequisites: PolS 200 and one other 300- or 300-level political science course. Political Science 220 is recommended.

Additional Faculty of the Graduate College

The following faculty hold graduate standing and teach in departments that presently offer graduate-level courses but not graduate degrees.

Jack L. Davis, Assistant Professor of Classics
 James Dearing, Assistant Professor of Music
 James H. Dee, Assistant Professor of Classics
 Matthew W. Dickie, Associate Professor of Classics
 Donald L. Ehresmann, Associate Professor of History of Architecture and Art
 Elizabeth R. Gebhard, Associate Professor of Classics
 William M. Kaplan, Associate Professor of Music
 Alexander P. MacGregor, Assistant Professor of Classics
 Gerald A. McWhorter, Associate Professor of Black Studies
 Richard A. Monaco, Professor of Music
 Robert Munmann, Assistant Professor of History of Architecture and Art
 Richard Norton, Associate Professor Music
 John W. Nunley, Assistant Professor of History of Architecture and Art
 John T. Ramsey, Assistant Professor of Classics
 David M. Sokol, Associate Professor of History of Architecture and Art
 Theodore J. Tracy, Associate Professor of Classics
 John Vaio, Associate Professor of Classics
 Carroll W. Westfall, Associate Professor of History of Architecture and Art

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